November 25 Cents

POPULAR MECHANICS MAGAZINE

WRITTEN SO YOU CAN UNDERSTAND IT

REGD. TRADE MARK GREAT BRITAIN No. 410476

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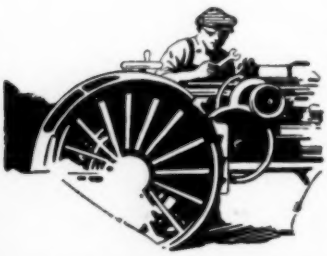
HOW FAR CAN A LOCOMOTIVE JUMP ?

See Page 675

It takes *only* 8 weeks to get a big job

O. H. Justus owns a big agency and repair shop at Parkersburg, W. Va. He says "that my schools give motor secrets that will put any man 'on easy street.'"



Emanuel Rushfeldt, Alberta, says: "Earning $10 a day and only 20 years old."

W. W. Peace gets $250 a month and expenses operating a tractor in the oil fields.

Louis Beimer at 24 was made foreman over men many years older. That's not luck—*it's Rahe training.*

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JUMP ?
See Page 67

Popular Mechanics Magazine

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WRITTEN SO YOU CAN UNDERSTAND IT

Vol. 38 NOVEMBER, 1922 No. 5

New "King of the White Water"

BEFORE an audience of 10,000 persons at Seattle, Wash., recently, famous log rollers from various parts of the United States and Canada met in competition to determine who should have the right to call himself "King of the White Water," champion log burler of the world. A. F. Speigel, Washington lumberjack, former world's champion, went down to defeat before Matt Dillon, woodsman of Hoquiam, Wash., following a spirited battle lasting 43 minutes—the longest contest of its kind on record.

Log-rolling contests originated in the woods of the eastern part of the United States and Canada. Long before the advent of the steam sawmill, burling contests were held in Maine, Wisconsin, Michigan, and the famed North Woods of Quebec and Ontario. There was hardly a lumbering district that did not have a champion who could "ride the whitest water and cuff a log from daybreak to dark." In more recent years log-rolling contests have moved to the Pacific coast along with the main lumber industry.

The recent contest, in which the world's championship changed hands, was held in the Lake Washington Ship Canal.

Matt Dillon, New World's Champion Log Roller, at Left, at the Start of His Record 43-Minute Battle —the Longest Contest of Its Kind on Record—Which Won Him the Lumberjacks' Coveted Title of "King of the White Water"

Pike poles and other balancing aids were barred. The log used for the contest was of fir, 13 feet long and 18 inches in diameter, turned on a lathe to assure perfect cylindrical form. Contestants wore bathing suits and calked shoes. The contest was a test of strength, agility, and headwork. A purse of $200 rewarded the winner, who in addition enjoys the title of champion log roller of the world.

COLOR AND SHAPE GLASSES TO MATCH HAIRDRESS

Claiming that health and beauty permit neither light lines above the eyes nor dark lines below them, and that therefore eyeglasses of a single color are impracticable, an optician has designed glasses with the top rim in dark hues and the lower rim in various light shades. Carrying the idea of beauty a step farther, he has also made the upper rim with different contours to conform to the wearer's eyebrows, hairdress, or hat.

Above: Eyeglasses Conforming to Lines of Hat and with Upper Portion of Rims Darkened. Left: Eyeglasses of Crescent Design and with Shaded Rims

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¶It is estimated that motor-driven vehicles in the United States have a combined power equivalent to more than 300,000,000 horses, while the total number of horses and mules in the country is less than one-tenth that figure.

DEEP BRAZILIAN MINE NEEDS PRECOOLING OF AIR

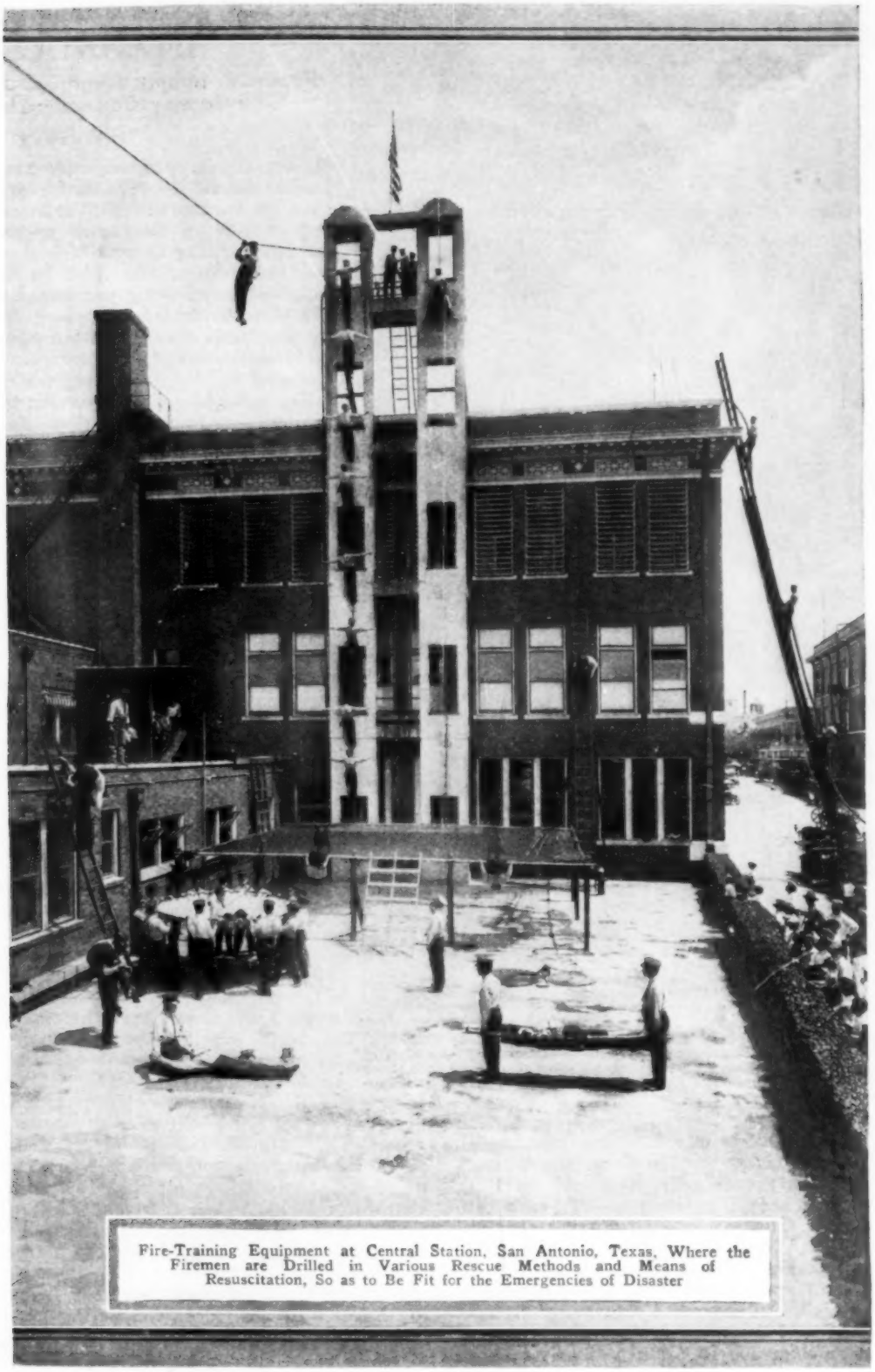
Miners working nearly one and a quarter miles below the earth's surface in Brazil, South America, find the temperature of the surrounding rocks to be 118° F. To overcome this impossible working temperature, a system of precooling the air with large fans has been installed. The effectiveness of this system is now being studied by the U. S. Bureau of Mines with a view of adopting a similar practice in some of the deeper mines in this country.

TEAPOT HEATED BY CHARCOAL COMMON SIGHT IN CHINA

Teapots heated by charcoal are common sights in China, where the affable host invariably serves a cup of tea to the visitor, even at business houses. The curious-appearing utensils are "two stories" in height—the upper being for tea and the lower for the charcoal burner—and are made of brass. These articles have been in use in that country for several centuries, and some contend that the elaborately finished percolators used for making coffee and tea in modern homes, are in fact modifications of the ancient Chinese teapot.

CENTRAL-STATION DRILLS TRAIN FIREMEN

The city of San Antonio, Tex., has been getting some highly gratifying results from the intensive training given the city firemen at the central station. This station has special towers for drill in climbing and rescue work. A permanent net is provided to guard against accidents. Members of the various companies have their definite days for this drill work and gain nimbleness in climbing ladders, rescuing supposed fire victims, etc. They are taught the use of the life net and the proper methods to induce respiration, as well as many other pointers that are of practical value to them when they are on actual service. Gymnastic exercises are also a part of the work in keeping the firemen in fit physical condition for the strenuous duties they have to perform in case of fire.

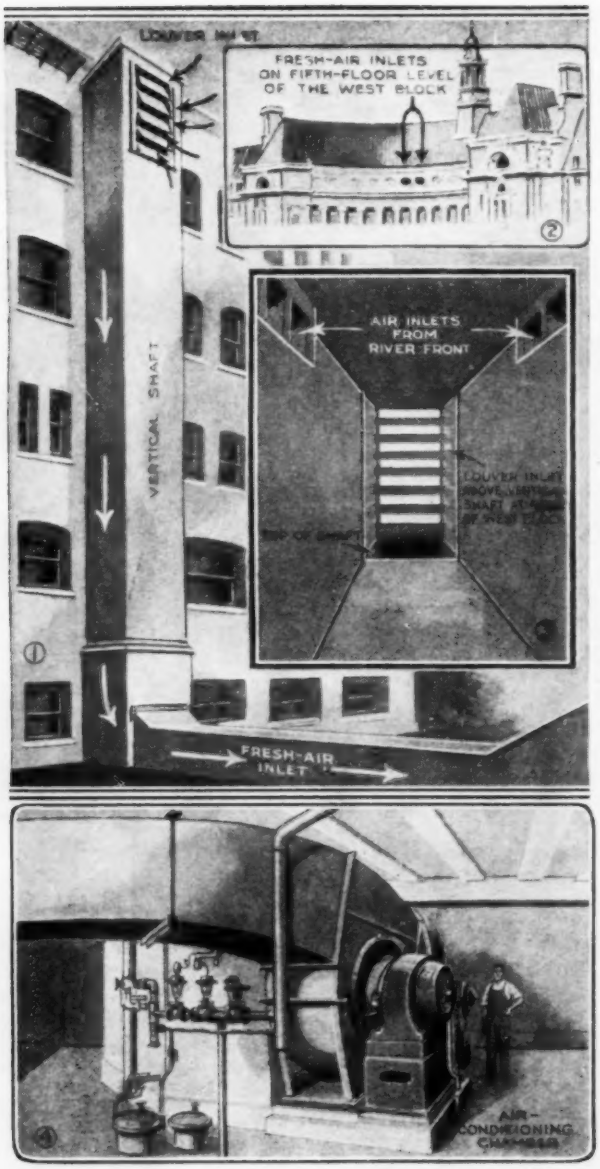


Fire-Training Equipment at Central Station, San Antonio, Texas, Where the Firemen are Drilled in Various Rescue Methods and Means of Resuscitation, So as to Be Fit for the Emergencies of Disaster

PUSH-BUTTON IN LONDON

Fresh-Air Supply Controlled at County Council—No

By HENRY



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View 1 Shows One of the Glazed-Brick Shafts on the Rear Wall of the Council Chamber; 2, the Air Inlet on the Front Wall of the Chamber, and 3, Air Corridor Connecting Front and Rear Inlets. View 4 Shows Large Fan in the Conditioning Chamber

ONE of the largest structures in London, England, is the new County Hall that was formally opened on July 17, 1922, although the cornerstone of the building had been laid as long as 10 years previously. That so long a time was required to complete the building was the result of delays caused by the war.

This new home for the London County Council, and its rapidly growing staff, is 750 feet long, with an average width of more than 300 feet, and comprises seven stories above ground, and two stories below it. The latter are used for storage and for the housing of one of the most up-to-date ventilating systems that has ever been installed. The building is situated along one bank of the river Thames and the whole of the site is covered with a concrete raft, five feet thick, surrounded by deep retaining walls.

The most interesting portion of the building is the council chamber, which accommodates 200 members. Octagonal in shape, it is 55 feet high, and is lined with beautifully finished marble and oak paneling, in the same style as the committee rooms, lobbies, and main staircase.

Very elaborate means have been furnished for the heating and ventilation of the whole of the building, but especially with regard to the council chamber, which is supplied with filtered air, conditioned at a constant temperature of 65 degrees by means of apparatus controlled by thermostats. Louver air inlets are located at the roof level of the front and rear walls of the council chamber, and after passing down glazed brick shafts, the air enters the conditioning chamber below the ground level through inlets controlled by dampers. Thence the air passes to the humidifier where it is thoroughly cleansed and saturated. Automatically controlled batteries warm the air in winter to a constant temperature of 65 degrees. In hot weather the air is cooled by blocks of ice which are melted rapidly by spraying them with water. After being conditioned the air is propelled by electric fans through mains to a maze of distributing pipes below the chamber floor. That it is indeed a maze is caused by the fact that an air-supply pipe leads to every one of the 200 members' seats.

Here becomes apparent the most striking novelty of the whole ventilating system. At each seat is a desk, at the back of which is an outlet register pointed up-

VENTILATION BUILDING

Seats by Members of London Conflicting Air Currents

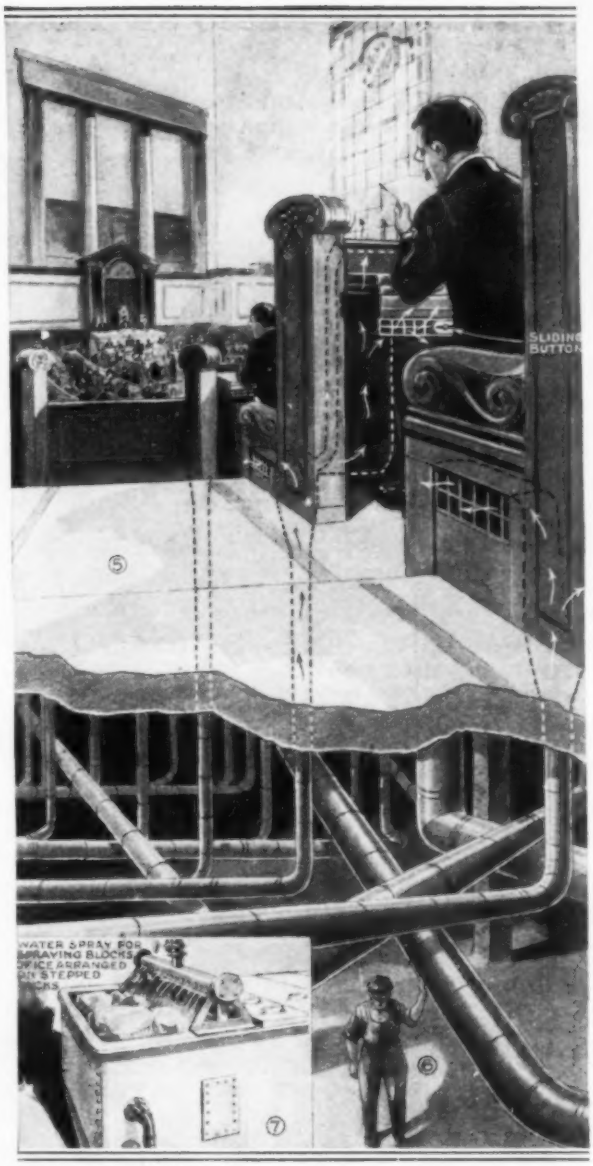
S. WHITE

ward, and another register below the desk pointed horizontally in such a manner that air issuing from it strikes the occupant of the seat like the breeze from a fan. On the horizontal register is a sliding button that controls a valve in such a manner that the occupant of the seat can switch the air either to the vertical register that carries it upward without affecting him individually, or to the horizontal one that directs the air to himself without affecting his neighbor. Additional fans remove the vitiated air from the floor level, and from the roof of the chamber.

Some idea of the capacity of this ventilating system may be gathered from the fact that, without creating any appreciable draft, the air is replaced in the chamber at the rate of over 1,000,000 cubic feet an hour.

In ordinary English summer weather, the refrigeration by means of melting ice, mentioned above, can be dispensed with. Instead, by the evaporation of some 20 or 30 gallons of water an hour, the temperature inside the chamber can be kept at from 10 to 20 degrees below the outdoor shade reading.

In every respect the work on the building has been carried out in accordance with the highest standards of material and workmanship. The total area of the site is about 6½ acres, and including reclamation work, the total cost of the building will be nearly 20,000,000 dollars.



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View 5 Shows the Registers at Each Seat, and Button on Desk Register with Which Air is Directed Either Vertically or toward the Occupant of the Seat; 6, the Maze of Pipes under the Chamber Floor, and 7, Part of the Ice Tank for Cooling the Air

MAKING CROSS-COUNTRY TRIP ON ROLLER SKATES

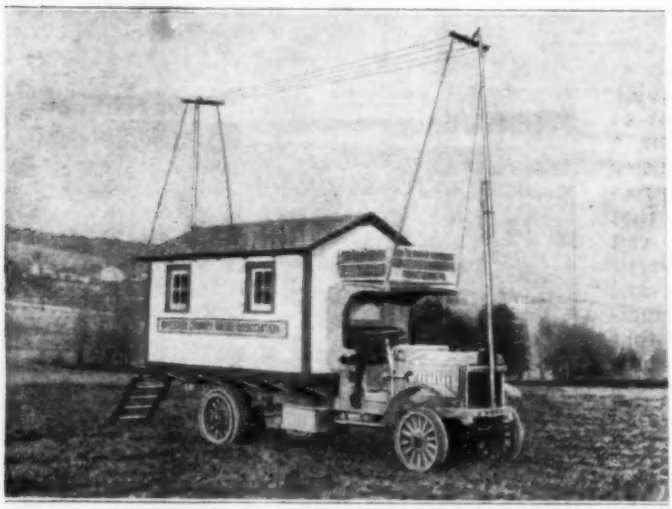
Trying for a record in long-distance skating, an American married couple are roller-skating from Philadelphia to the Pacific coast, with the intention of also making a return trip regardless of road conditions and other obstacles. The skaters, who are now in the West, manage to make expenses by doing trick and fancy skating at local theaters. They sleep outdoors in camp sacks when the weather permits. To make a perfect record, both refuse to accept offers of "lifts" from automobilists.

¶ The United States uses yearly 2,000,000 tons of newsprint which, if cut into a ribbon of the width of the average daily newspaper, would have a total length of 40,000,000 miles.

PRIVATE RADIO STATION WELL EQUIPPED

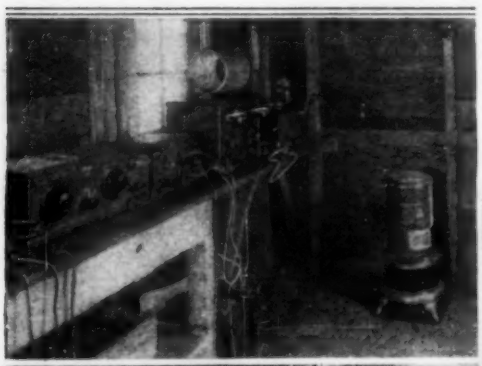
By H. A. LANE

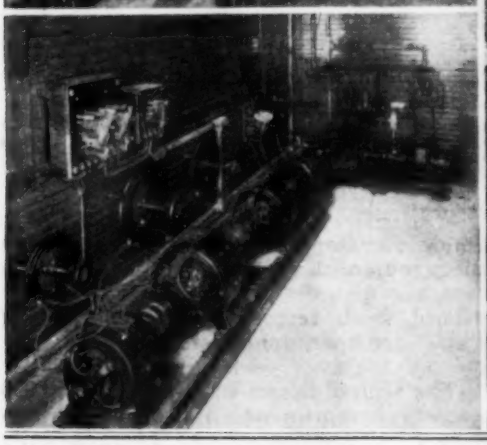
ELABORATE equipment is contained in a private radio station at Parkesburg, Pa., which has three licenses, "3 Z O," "3 X W," and "3 O I," these covering any combination of wave lengths not reserved by the navy. A number of transmitters, including a spark set of 325 meters, a radiophone set with a wave length of 3,660 meters, an open-arc set operating on 2,500 meters, and a 50-watt vacuum-tube, self-rectifying set working on 360 meters, are installed in this station. Four generators of 100, 600, 1,000, and 4,000 volts, furnish the direct current for the outfit, the receiving apparatus of which is inclosed in zinc-lined rooms, while the cabinets and lamp closets are constructed of the best bakelite.

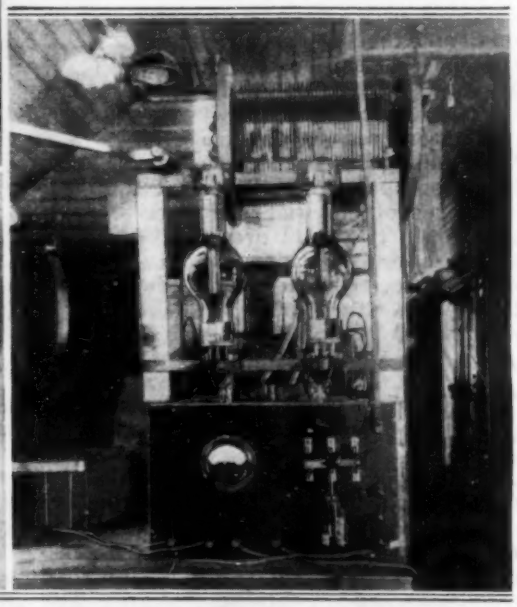


Mobile Wireless Station Which Contains a Complete Equipment for Transmitting and Receiving Radio Messages or Music

The antenna is erected 185 feet in the air and is 350 feet in length, messages and music being received from New Mexico, Maine, and the coast of Wales, which are relayed to other smaller stations or broadcast through a gigantic megaphone for a distance of seven miles. In connection with







Upper Left: A Corner of the Elaborately Equipped Radio Station at Parkesburg, Pennsylvania, Showing Some of the Many Cabinets and Storage Batteries. Lower Left: Generator Room with the Direct-Current Machines and Controlling Rheostats. Right: Two of the Huge Amplifier Bulbs and Accompanying Apparatus

this station, a complete broadcasting and receiving set has been mounted on a motor-truck chassis and is inclosed in a miniature house which has windows in the sides, a door at the rear, and is equipped with adjustable aerial masts. The mobile equipment tours the suburban districts in an effort to arouse the people to a greater interest in the wonders of radio.

HONDURAS NOW BUILDING MOTOR HIGHWAYS

It is announced that a new motor highway across Honduras, from the Atlantic to the Pacific, will be completed within the next three months. Work is also in progress on several other roads for motor traffic on the Atlantic coast and in the interior. There are no railways except along the Atlantic seaboard, and traffic in the country is now changing from antiquated oxcarts to motor trucks and automobiles.

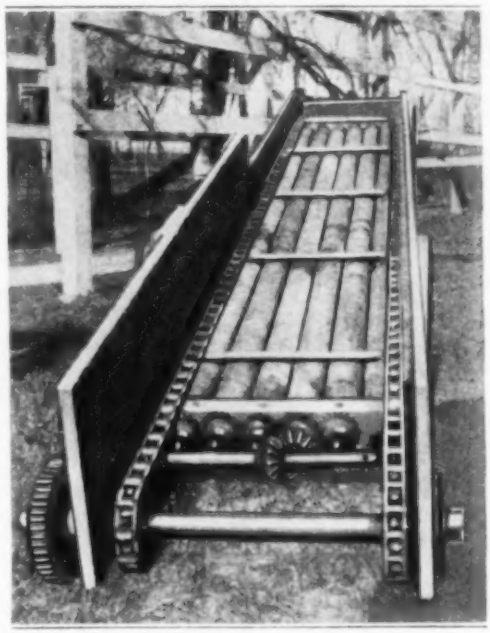
BLISTERED PAINT REMOVED BY COMPRESSED AIR

Removing old or blistered paint with the aid of an air blast, instead of by the usual gasoline-torch burning method, is possible with an appliance which can be attached to any compressed-air outfit. A special scraper, having an air slot about 2 inches above its cutting edge, is inserted under the loose scales of the old paint, whereupon the powerful blast literally blows them off. As this procedure leaves a smooth surface, more efficient workmanship is assured, since the fresh coat of paint can be applied evenly.

Blistered-Paint Remover Which is Operated by Means of Compressed Air, Showing the Special Scraper Attached to the Air Hose

EAR-CORN CLEANER REMOVES SHUCKS AND SILK

Ear corn may be efficiently cleaned of shucks and silk by an appliance that has six long toothed rollers which are driven



Ear-Corn Cleaner That Removes the Shucks and Silk, Showing the Endless Conveyor and the Rollers Which are Fitted with Teeth

by the same mechanism that operates an endless conveyor. As the conveyor carries the corn over the revolving rollers, the teeth of these tear the shucks and silk from the ears, while any loose grains fall between the rollers onto a screen, from which they can be sacked.

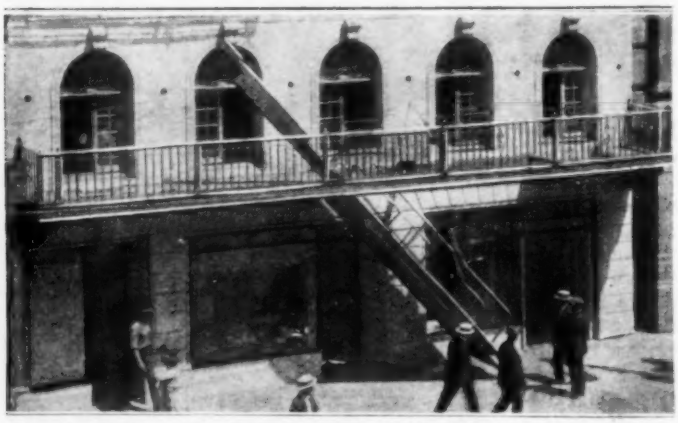
"RECREATION ENGINEER" ADDED TO FOREST SERVICE

"Recreation engineer" is the title given to a new official working under the direction of the U. S. Forest Service, for the development of public camp grounds and summer-home sites in the national forests of the West. It is estimated that 5,500,000 tourists visit the national reservations yearly.

BALCONY AND FIRE ESCAPE ATTRACTIVELY COMBINED

A balcony and first-story gravity-type fire escape are attractively combined in a new design which conceals the fire escape when not in use. This type is not new, but contrary to the usual escape of this kind the weights are concealed in the front edge of the balcony, while steel sheeting is bolted under the steps, to match the decorated undersheeting of the rest of the balcony. There is nothing to be seen from the street which would lead one to believe that this attractive balcony also had a fire escape.

Ornamental Balcony Which has been Designed to Conceal a Gravity-Type Fire Escape, Showing a Man About to Descend



Here the Fire Escape is Shown Lowered by the Weight in the Front End, and a Man is Seen Descending It

LOW-MELTING-POINT ALLOY FOR DIAMOND SETTING

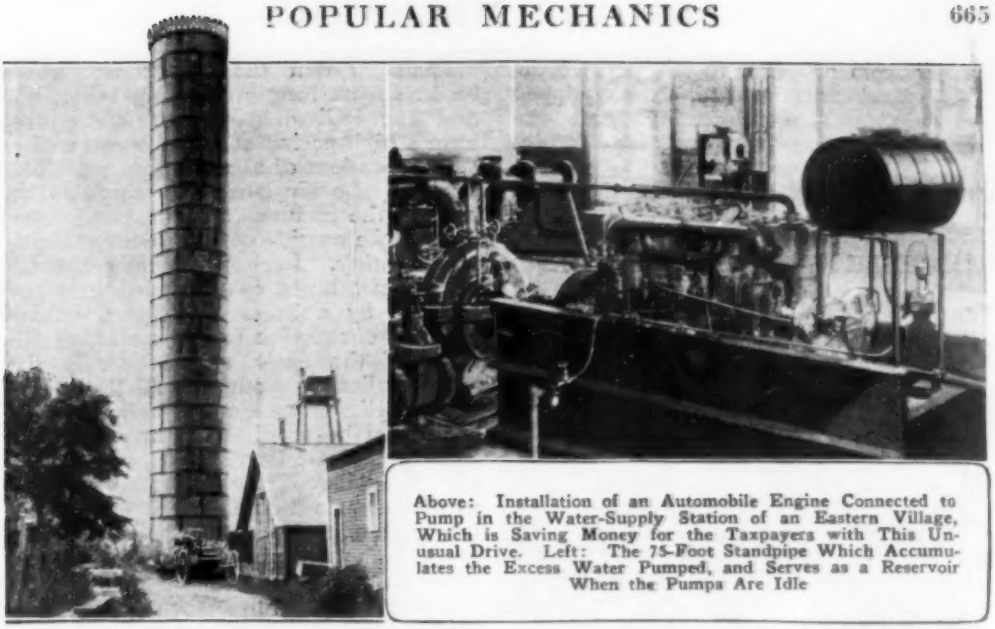
A manufacturer of diamond-pointed tools used for cutting for many industrial purposes, has developed an alloy metal that melts at about 300° F., cools quickly, and becomes as hard as steel. This low degree of heat cannot harm the diamond, which is held firmly as the alloy contracts in cooling. The superiority over setting diamonds in steel which melts at about 3,500° F., with the danger of injury to the diamond and the tendency to form blowholes, is apparent.

FATAL ELECTRICAL SHOCK FROM PECULIAR CAUSE

Standing with her bare feet on a wet floor, a scrubwoman touched the glass bulb of an ordinary electric lamp and was instantly killed. Doctors stated that death was caused by electrocution. Horrified by the unusual occurrence, her employers called in an electrical expert to make a thorough examination. Upon closely scrutinizing the lamp bulb, the investigator discovered a thin streak of lime on the glass, extending from the base of the lamp to within a few inches of the tip. Voltmeter tests plainly indicated a heavy leakage of current through the lime. Further experiments illustrated the danger in conductive deposits upon the surfaces of electric lamps, when extending from the "live" base, this hazard increasing in proportion to the humidity of the surrounding atmosphere and the effectiveness of the contact made with the "ground," or floor, which would complete the circuit through the body.

FLASHLIGHT RAZOR PERMITS SHAVING IN THE DARK

A new combination of flashlight and safety razor will enable all those who are in the habit of shaving themselves to shave when the lights are out, or to shave with more comfort where the light is poor. The handle of the razor is a flashlight and throws a brillant glow on the face.



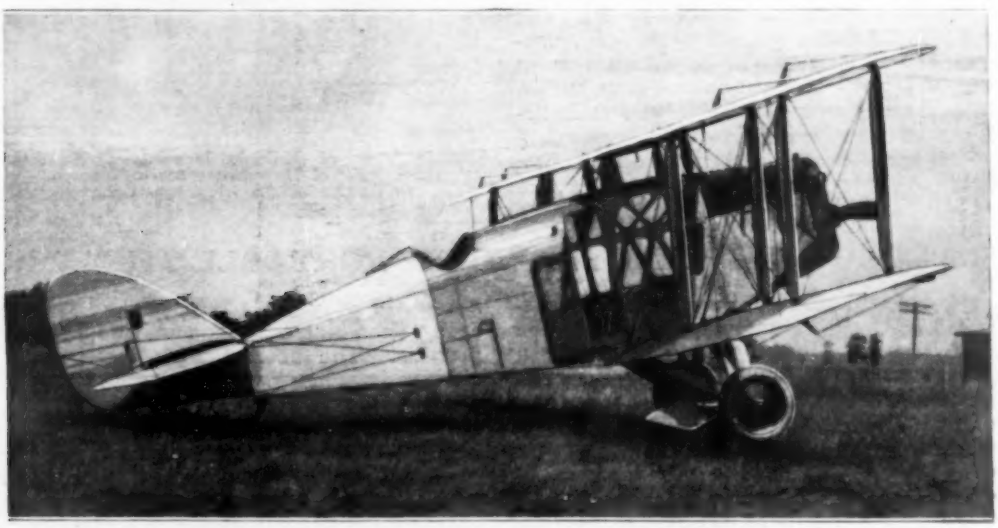
Above: Installation of an Automobile Engine Connected to Pump in the Water-Supply Station of an Eastern Village, Which is Saving Money for the Taxpayers with This Unusual Drive. Left: The 75-Foot Standpipe Which Accumulates the Excess Water Pumped, and Serves as a Reservoir When the Pumps Are Idle

VILLAGE WATER-SUPPLY PLANT RUN BY AUTOMOBILE ENGINE

An eastern village has adapted a well-known automobile engine to the operation of its water-supply system. The engine is direct-connected to a centrifugal pump which takes the water from the filter reservoir, and forces it some distance into a standpipe located on a hill. The motor, which will develop 120 horsepower, normally operates at 70 horsepower in pumping about 1,200 gallons per minute. This gasoline engine has replaced a steam-driven unit at considerable saving to the taxpayers, and is said to represent a more economical installation than electric-motor-driven pumps.

FIRST AMERICAN-CONSTRUCTED SIX-PASSENGER BIPLANE

The first six-passenger cabin biplane built in America was only recently completed. It is equipped with the latest type 12-cylinder Liberty motor which can be started by cranking from within the cabin, and will attain a speed of 100 to 125 miles per hour. The plane has a wing spread of 43 feet 7 inches, measures

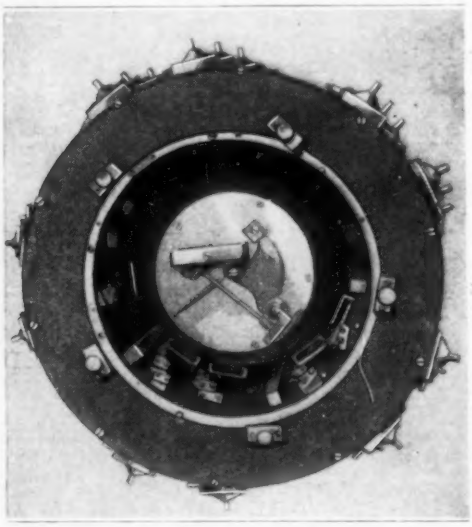


This First Six-Passenger Cabin Biplane Built in America Is of Interest Because of Its Equipment and Its Possible Adoption for Commercial Use on a Proposed Air Route

29 feet from propeller to tail, and weighs 3,500 pounds without load. It is equipped for wireless communication, and the cabin, with side-door entrance, is designed for the comfort of the passengers and for protection from the wind and elements.

MULTIPLE MANOMETER RECORDS AIRPLANE PRESSURES

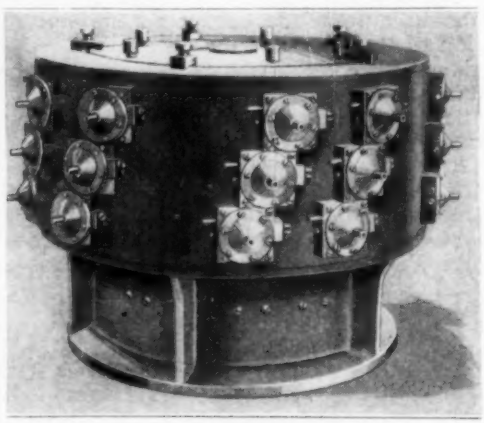
A multiple manometer specially designed to record the air pressures at 30



Top View of Multiple Recorder, with Film Drum Removed, for Measuring Air Pressures on the Surfaces of an Airplane

different points on an airplane in 30 seconds has recently been developed by the National Advisory Committee of Aeronautics. Its particular application is in measuring the magnitude and distribution of pressures over the horizontal tail surfaces of a machine in flight, regarding which there have heretofore been no real data.

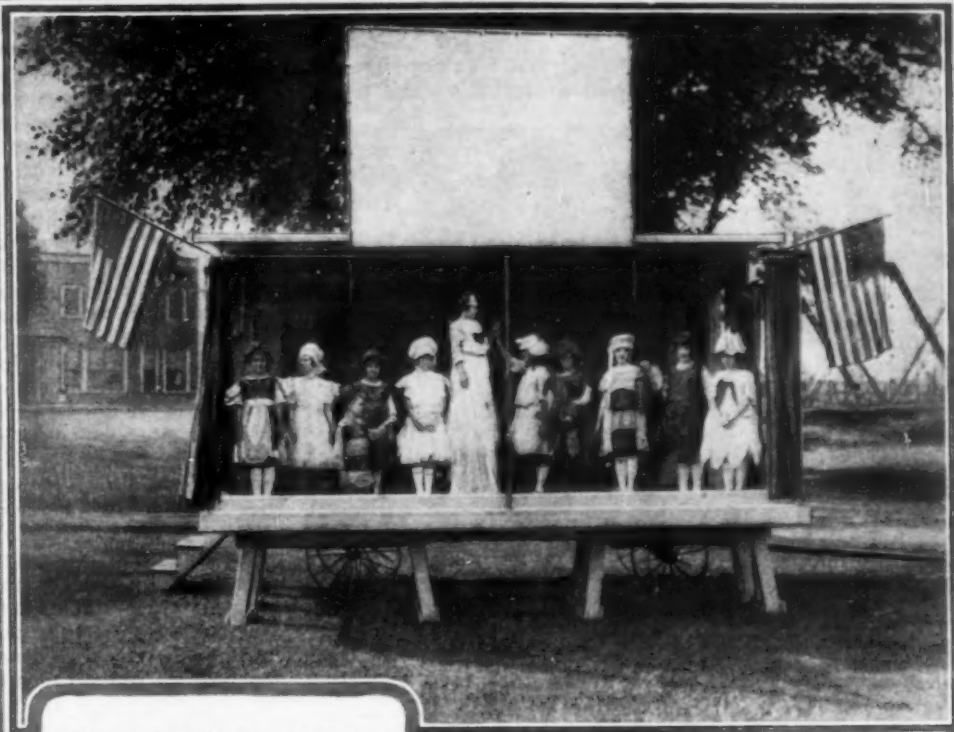
Realizing that the instrument should be free from long connecting tubes, and that the individual manometers should have a high period of vibration as well as be independent of acceleration and vibrations in the airplane, the designers arranged the manometers in three rows around the outside of a cylindrical aluminum casting. Each manometer consists of a small brass case divided into two sections by a brass diaphragm, with a pressure connection to either side. Movement of the diaphragm rotates a tiny mirror delicately mounted. At the bottom of the cylinder an electric bulb throws a horizontal beam of light through a fine slit, which light is reflected by 10 prisms on the inside of the cylinder, up to 30 small prisms which throw it against the mirrors, and these in turn reflect the light upon a photographic film placed upon a drum in the center of the cylinder. A rotating shutter causes the light to reach each of the 30 mirrors in succession, as the film drum is moved into correct position by a tenth of a revolution after each exposure.



Outside View of Multiple Manometer: Note the Three Rows of Manometers Arranged around the Outside of the Aluminum Cylinder

"ONE-NIGHT STANDS" PLAYED BY PORTABLE THEATER

"One-night stands," on a "circuit" composed of the different playgrounds of the city, are the "bookings" obtained for a portable theater in Elmira, N. Y. The miniature playhouse, designed for community service, has, when closed, an outward appearance of a small house on wheels, with doors at either end. One side of the structure can be lowered by a lever arrangement, to provide a stage 16 feet wide by 15 feet deep, around which a curtain may be stretched and which easily accommodates a cast of 15 to 25 persons. The outfit, which can be efficiently handled by one man, is fully equipped with footlights, border lights, motion-picture screen, piano, and other necessities of the theater. Since the introduction of the innovation, thousands of spectators have crowded the parks nightly, to witness the performance of plays by children.

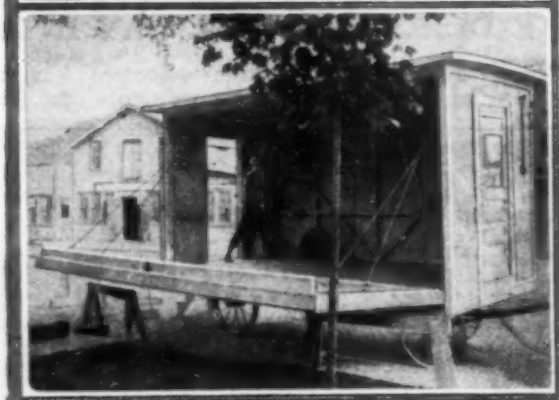


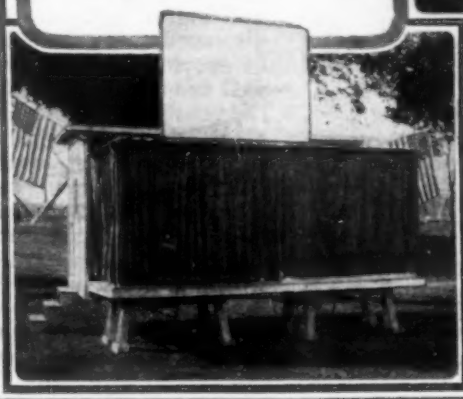
Above is Seen the Portable Theater of Elmira, New York, with Curtain Drawn Back and Cast Assembled at One of the Performances. Note the Picture Screen

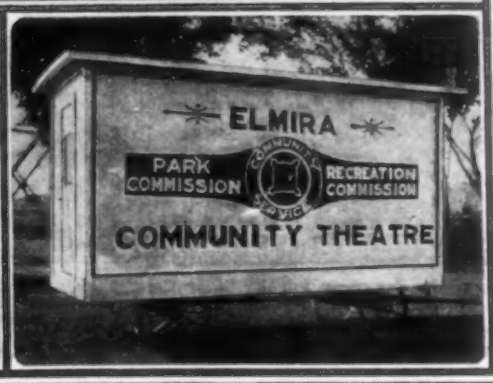
At the Right is Shown the Manner of Lowering One Side of the Outfit by Means of a Lever Arrangement, the Lowered Side Forming the Stage

Below, at the Left, the Theater is Shown with the Curtain Drawn around the Stage, While the Players Make Up and Don Their Costumes

At the Lower Right is Seen the Theater Entirely Closed Up and Ready to be Hauled to Another Playground

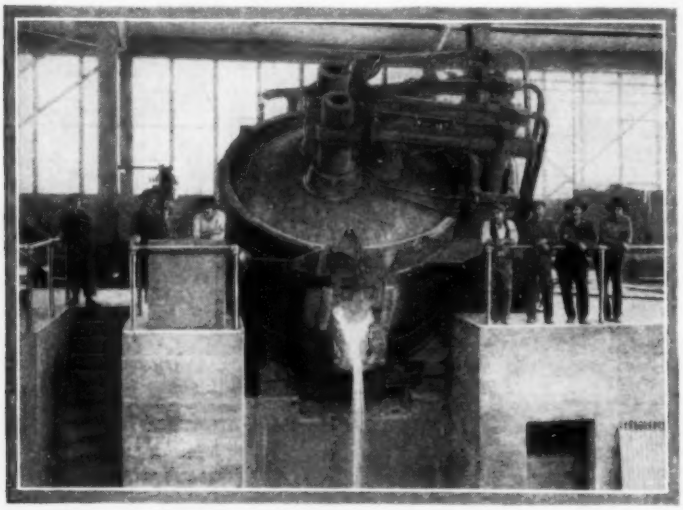






COPPER PIPES AS CONDUCTORS FOR ELECTRIC FURNACES

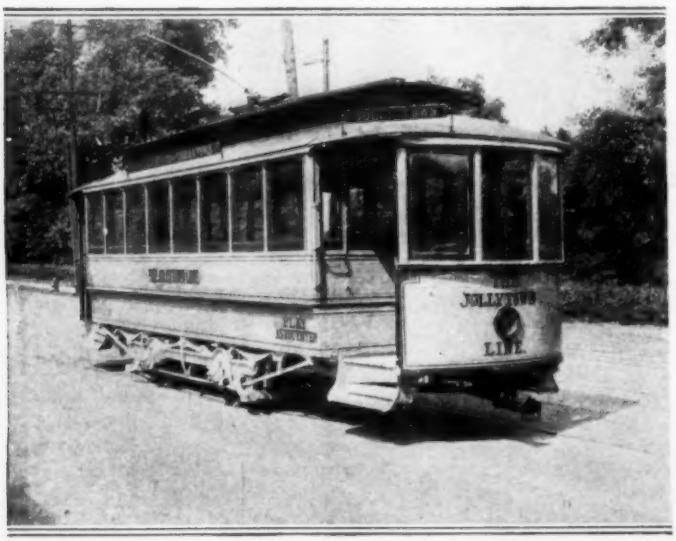
An improvement in electric-furnace practice, for the making of refined steel and alloy metals, is the substitution of copper pipes for the ordinary type of solid or built-up copper busbars used to conduct the electric current to the electrodes of the furnace. At a plant where this has been done, the construction has not only been simplified, but there has been an increase in efficiency of the Heroult type of furnace used for melting and refining monel metal. The hollow circular section has an electrical advantage in conducting alternating current, and, in addition, the pipes are used to circulate water to cool the electrode holders. The cooling effect on the copper conductors is especially important where they have to be carried over a hot furnace, and in this case only one-third as much copper was required as when using busbars of older types.



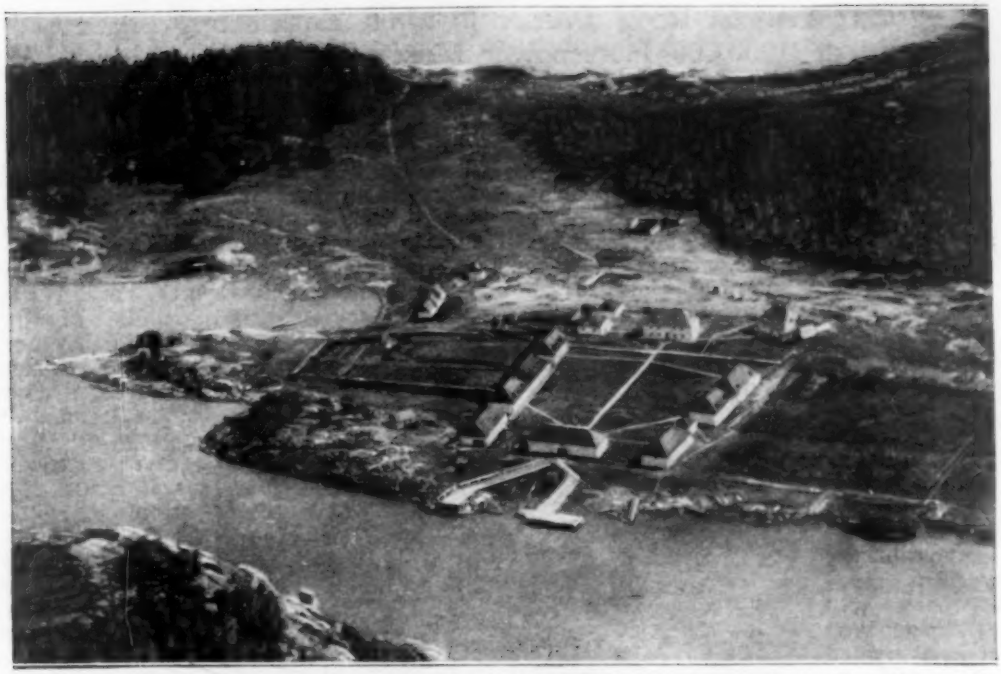
A Seven-Ton Electric Furnace, of the Heroult Type, Shown Tilted to the Pouring Position: This Furnace is Fitted with Copper-Pipe Conductors and is Used for Refining Monel Metal

KIDDIES PLAY ALL DAY IN REAL TROLLEY CARS

"Play as You Enter" is the welcome sign on the sides of the "Jollytown" trolley cars in Baltimore, near one of the city parks, where the traction company has set aside several cars for the children to play in. The cars are complete in every detail except that the power is turned off and they are anchored to the ground, to prevent the more venturesome kiddies from attempting to explore the busy down-town districts in them. Instead of the usual advertising cards, Mother Goose rhymes and animal pictures are displayed along the sides, to provide instruction as well as entertainment for the youngsters. The constant din of register bells, clanging gongs, starting and stopping signals, and the loud calling of imaginary and unheard-of street names, afford a noisy proof to the amused passers-by of the extreme popularity of the "play cars" as the crews take them along fancied routes.



One of the Extremely Popular "Play Cars" Which have been Set Aside for the Kiddies to Play In, Showing the Welcome Signs and the Completeness in Detail of the Cars, Even to the Trolley



A View of Norway House, a Famous Trading Post of the Hudson's Bay Company in the Early Days of the Canadian Northwest, as It Appears Today after being Converted into an Airplane-Service Station by the Dominion Government

FAMOUS TRADING POST NOW AIRPLANE STATION

The advance of civilization in the wilds of Canada is strikingly shown by the establishment of an official air-service station at Norway House, one of the famous posts of the Hudson's Bay Company at the northernmost tip of Lake Winnipeg. The forest-patrol work that is being done from this station is of the greatest value in protecting millions of dollars' worth of the choicest timber from fire. The old trading post has taken on new life and importance since the coming of the birdmen.

Norway House was for over 100 years one of the great transfer points of the Hudson's Bay Company. It is situated on the shore of Playgreen Lake, a body of water formed by the expansion of the Nelson River just after it has left Lake Winnipeg on its way to Hudson Bay. It is roughly in the center of a large triangle, of which the angles are York Factory on Hudson Bay, Winnipeg (Fort Garry), and Edmonton. It is, in round figures, 500 miles from Hudson Bay, 300 miles from Fort Garry, and 550 miles from Edmonton. From Norway House the Nelson and Hayes rivers run northeasterly to Hudson Bay, the great Saskatchewan River gives access across the northern line of prairies to the foothills of the Rocky Mountains, and Lake Winnipeg and the Red River make a highway to Fort Garry and the Pembina country.

The old post was thus at the main crossroads of the whole of middle Canada, and the wealth and commerce of this wonderful region passed annually through its gates. In the days when the goods for the Hudson's Bay Company's trade came in through York Factory, at the mouth of the Nelson River, it was not the custom to send the fleets of York boats (big freight skiffs, 40 feet long) from York Factory clear through to Edmonton. Instead, the vessels from the sea went as far as Norway House, where they met the fleets from Edmonton and Fort Garry. The traders from the South and West turned over their bales of furs to the men from the seacoast and returned to the Saskatchewan and Assiniboine trading posts with manufactured goods from Great Britain.

At such times all trails seemed to lead to Norway House, and now, when the big planes are skimming over the unbroken leagues of dark forests, their pilots are always eager for a glimpse of the familiar outlines of the old fort buildings.

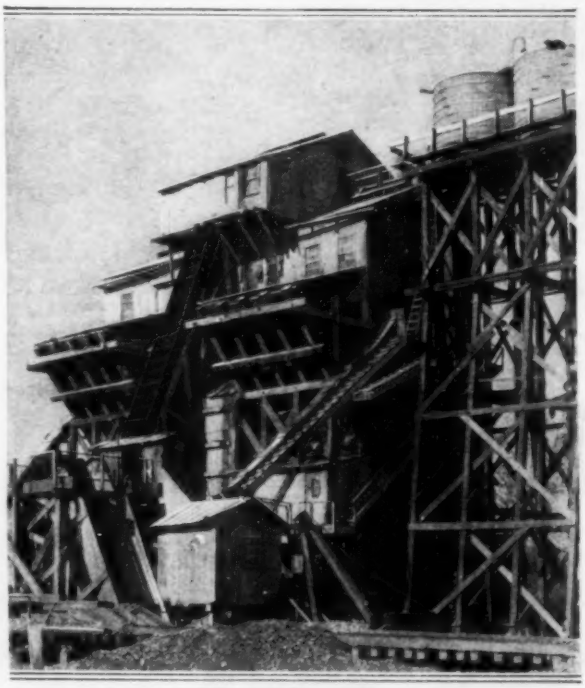
WILSON DAM

World's Largest River Barrier Is Main Engineering Feature of 1,000,000-Horsepower Muscle Shoals Power Project on the Tennessee River

By R. C. FOLGER

THERE has recently been considerable agitation to resume construction of the Wilson Dam, across the lower reaches of Muscle Shoals of the Tennessee River in Alabama, and it is felt in many quarters that, unless Congress accepts one of the offers now pending, the work should continue with government forces or under its supervision, until final disposition is made of the properties.

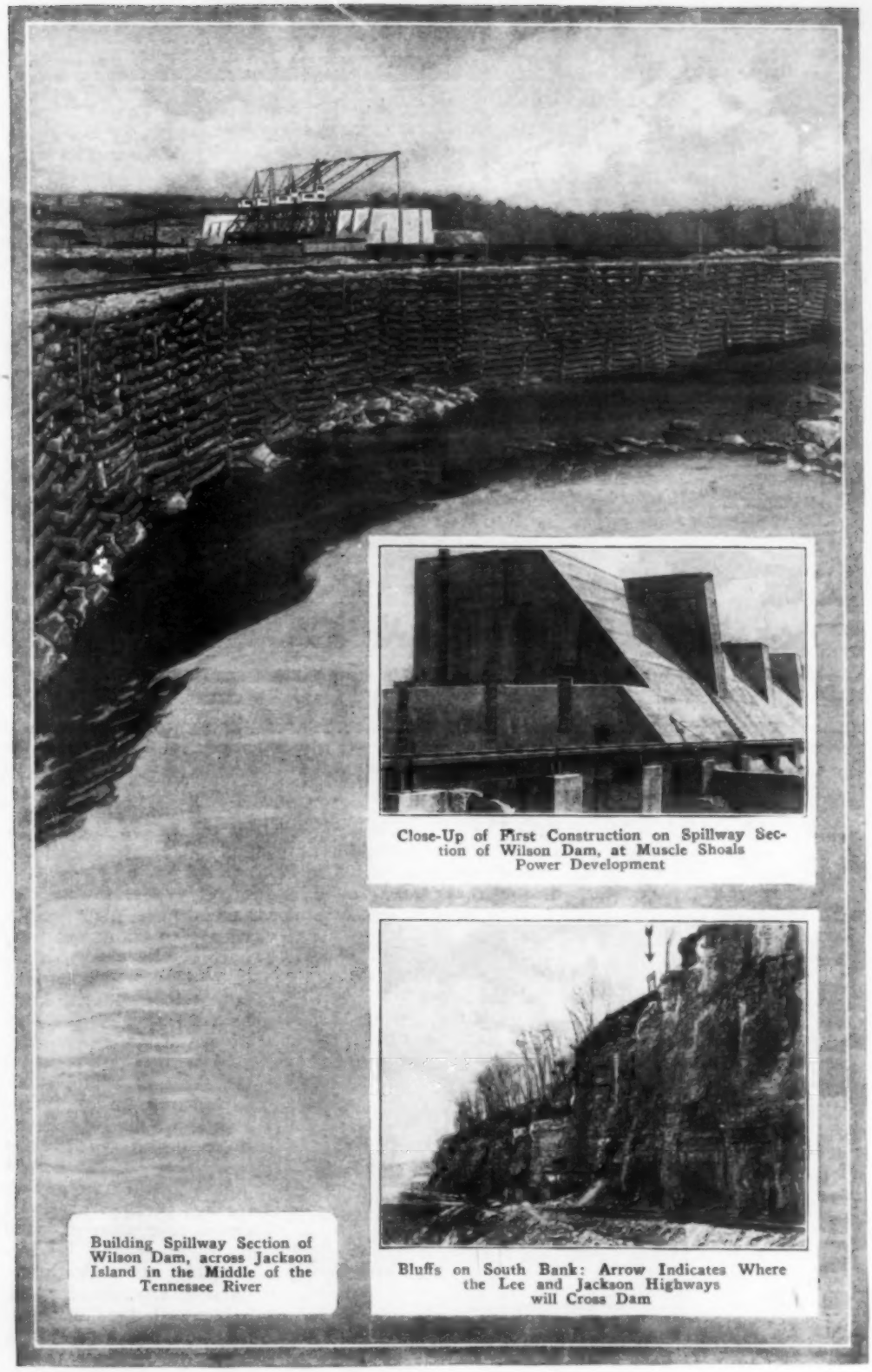
When completed, Wilson Dam will represent the largest river barrier ever built, making possible the world's greatest power-generating plant at an estimated total cost of over $40,000,000. With 1,200,000 cubic yards of masonry, the dam will be nearly three times the size of Roosevelt Dam in Arizona, twice as large as the Keokuk Dam across the Mississippi, and will exceed the world-famed Assuan Dam in Egypt by almost 100,000 cubic yards. Slightly more than 100 feet wide at the base, it will rise to a height of 100 feet, and will be 4,500 feet long. The water impounded by the dam will form a pond 1 to 3 miles wide and 15 miles long, submerging the much-talked-about Muscle Shoals, and will necessitate the clearing of 10,000 acres of timber land. There will be two electrically operated lock chambers at the north end of the dam, each having a lift of slightly more than 45 feet. The power house, forming an integral part of the south end of the dam, will be 1,184 feet long and house 18 generating units with a total capacity of 625,000 horsepower, which will require a high dam at the headwaters of the river in eastern Tennessee, to create an immense storage reservoir from which to regulate the flow of water through the river. Plans for the complete development of the power possibilities, providing for another dam at a site 15 miles above the Wilson Dam, will add 250,000 horsepower, and other smaller dams still farther upstream will bring the total up to 1,000,000 horsepower. A 25,000-horsepower steam plant supplies power for all the construction machinery, and will later serve as an auxiliary to the water-power stations.



This Large Crushing and Screening Plant, for the Preparation of Stone Aggregate Used in Concrete for the Wilson Dam, is Conveniently Located on an Island in the Middle of the Tennessee River

An interesting feature of the plans is the beautiful concrete bridge, spanning the entire length of the dam, that will mark the intersection of the Robert E. Lee and Jackson highways, and form a connecting link in both of these great transcontinental roads. The economic significance of the project lies not only in the abundance of cheap power it will afford, but in its situation in the midst of one of the richest ore belts in the world, which will permit the manufactured products from the iron ores of Alabama and Tennessee, the phosphate and dolomite deposits of Tennessee, and the potash shales of Georgia to be transported over one of the longest inland watercourses in the world.

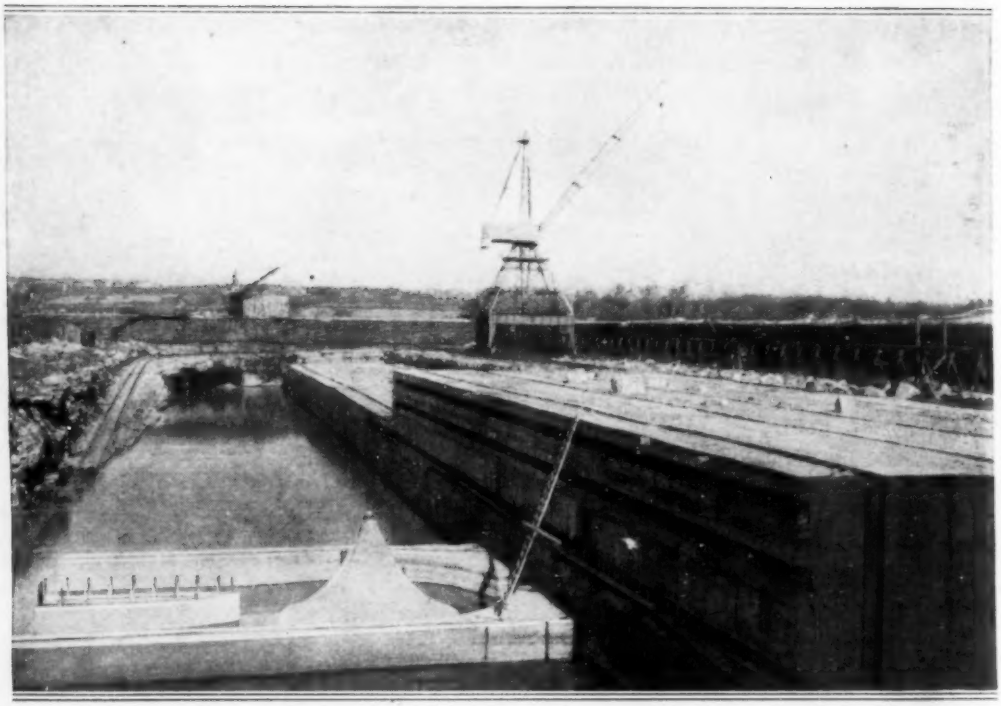
Begun during the late war for the purpose of supplying nitrates used in the



Close-Up of First Construction on Spillway Section of Wilson Dam, at Muscle Shoals Power Development

Bluffs on South Bank: Arrow Indicates Where the Lee and Jackson Highways will Cross Dam

Building Spillway Section of Wilson Dam, across Jackson Island in the Middle of the Tennessee River

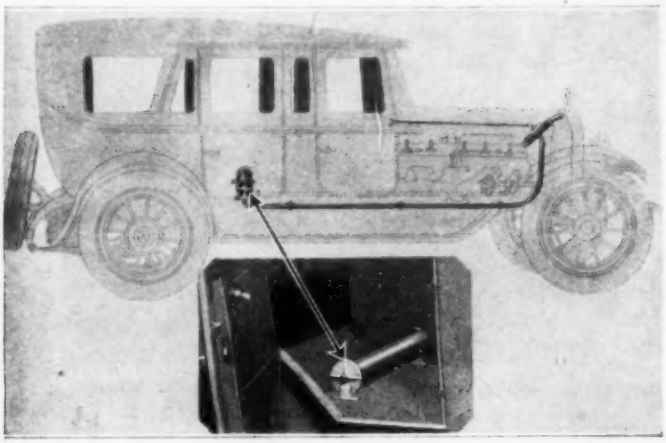


View Showing the 12-Acre Cofferdam, the Concrete and Limestone Foundation of the Power House, and, in the Foreground, One of the Water-Turbine Foundations for the Muscle Shoals Power Project

manufacture of high explosives, this enormous enterprise will be available for the future service of the country in time of necessity, and its strategic inland location greatly enhances its value from the standpoint of national defense.

MOTOR CARS NOW HEATED BY HOT WATER

Heating the interiors of motor cars with hot-water radiators connected in the circulating system of the engine, is the principle of a lately developed arrangement. The heaters are made in seamless-steel cylinder-footrail types, or in rectangular shapes, which are placed flush with the floor in any part of the car. An intake valve, which may be controlled from the dashboard, regulates the flow of water to the heater and consequently its temperature. The innovation can be easily installed in any machine; there is no operating cost, merely an extra gallon and a half of water being required in the circulating system, and no odor of any kind is possible, as is not infrequently the case with heaters that make use of the hot exhaust gases from the engine.



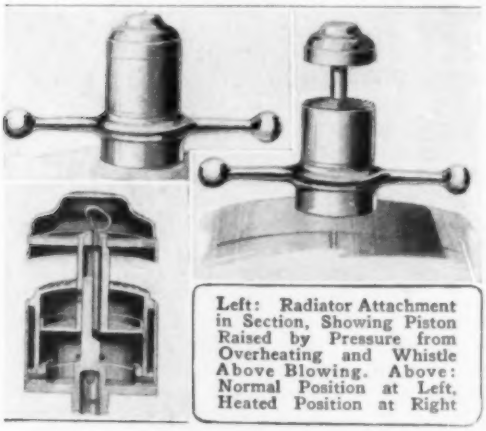
At the Top Is a Phantom View of a Motor Car with the Hot-Water-Heater System Installed, While at the Bottom a Close-Up of the Radiator is Seen

COLLEGE NEAR ARCTIC CIRCLE OPENED BY ALASKA

Seventy miles from the Arctic circle, at Fairbanks, Alaska, has been opened a college with courses in mining, agriculture, home economics, civil and electrical engineering, general science, and commercial work. The college, probably the farthest north of any in the world, was founded with an appropriation of $60,000 from the territorial legislature, while the Federal government will aid in supporting the institution by an annual subvention of $50,000. About 100 students are registered.

RADIATOR ATTACHMENT BLOWS WHISTLE WHEN OVERHEATED

A new automobile-radiator attachment helps to keep the water cool, and also acts as an alarm when the water becomes overheated. Attached to the radiator cap, a small closed cylinder, with a hollow wall that acts as a cooling chamber, contains a flat piston that is raised by the air pressure resulting from the overheated water. The top of the small cylinder is



Left: Radiator Attachment in Section, Showing Piston Raised by Pressure from Overheating and Whistle Above Blowing. Above: Normal Position at Left, Heated Position at Right

convex and bright red in color. Normally, this is covered by a cap connected to the piston rod which passes through the top of the cylinder. On top of the piston rod and under the cap is a whistle. As the pressure enters the cylinder through ports below the piston, this is raised high enough to expose the red danger signal; then as the pressure increases, the whistle is blown, and finally, when the water actually boils, the piston is raised high enough to allow the steam to escape through a port located in the hollow piston rod.

HANDY DEVICE FOR TURNING LEAVES OF SHEET MUSIC

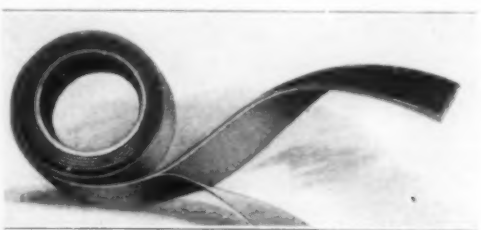
For turning the leaves of sheet music quickly when on the stand, a device has been placed on the market in England

Device for Turning Over the Leaves of Sheet Music on a Piano or Other Music Stand: It is Operated with the Fingers and Thumb in the Manner Shown

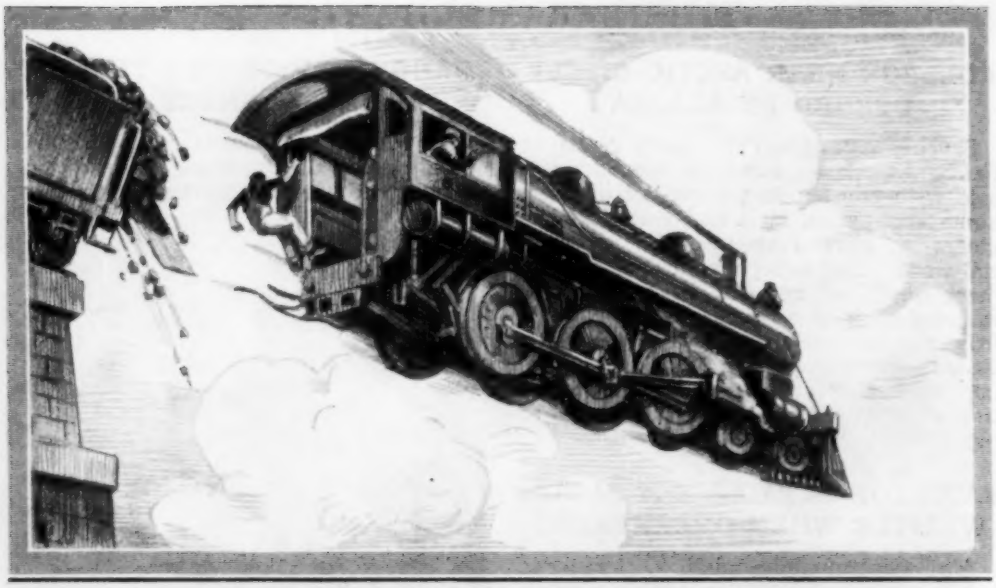
that is somewhat similar to several in this country, though said to be exceptionally simple. This leaf turner is operated by pressure of the fingers of one hand aided by holding the thumb against a small lug by the side of the lever.

RUBBER AND FRICTION TAPE COMBINED IN ONE ROLL

Electrical workers, when wrapping a newly made joint, can apply both rubber and friction tape from the same roll and at the same time, if a recently introduced insulating tape is used. The product comes in the usual half-pound rolls, ¾ inch in width, averages approximately 85 feet to the pound, and is covered with tinfoil. Advantages of the use of the article are, that the workman saves time by applying both kinds of tape at one operation, plenty of insulating rubber is assured on every joint, and only one kind of tape need be carried in stock.



Combination Roll of Rubber and Friction Tape Which Enables Electrical Workers to Apply Both at Once



HOW FAR CAN A LOCOMOTIVE JUMP ?

By FRANCIS W. WILSON

LOOK over a locomotive as it stands puffing in a train shed, and you regard its impressive bulk with a certain degree of awe. You cannot imagine this huge steel monster jumping at all. You would say that it couldn't jump. Imagine its solid supporting track removed, and you would predict that gravity would claim its own, regardless of the speed at which it might be traveling.

Stand close to the track as the same locomotive rushes past at 60 miles an hour, and you get another, and quite different impression—that of irresistible force, propelled at a speed which would hurl it across a sheer open space like a shell fired from a powerful gun. And then you change your opinion. Yes, you conclude, that, vast though its weight and clumsy its proportions, it might leap across a measurable span with rather a flat trajectory.

Your last impression is correct. A mathematician could tell you with reasonable accuracy just what might be expected if a locomotive of known weight, traveling at a given speed, arrived at a trackless open space. But more impressive are the known performances.

The bridge engineer of a certain railway showed me, some years ago, a photograph of a locomotive taken just after it had leaped across a 28-foot opening. The big drivewheels rested securely on the crossties after jumping the span left vacant by an opened drawbridge.

The locomotive had been at the head of a fast freight previous to the accident. It was down-grade to the bridge, and the draw was open. It was impossible to stop. The train plunged ahead, and the locomotive reached the opposite side of the channel and alighted right side up and undamaged. The tender fell into the opening, and cars piled up in a heap between the two abutments.

I asked for a copy of the photograph, but was politely refused. Railroads do not care to advertise their accidents—naturally.

Of a different kind but equally strange was a mishap which occurred on an eastern railway. A long freight was coming off a steep grade when something caught the truck of a car near the center of the train. Almost instantly this car fell to one side and tumbled down the embankment. At the same time the car following was wrenched free and thrown clear, on the opposite side of the track. Then, as if to put the finishing touch on this odd performance, the rest of the train eased down and coupled onto the forepart of the train.

An engineer in the maintenance-of-way department of a mid-west railway told me the following story, which I afterward verified, for it was difficult to believe.

"The locomotive reached the opposite side of the channel and alighted right side up and undamaged. The cars piled up in a heap between the two abutments."

"At this stage 15 feet of steel rails spanned the opening. From them the crossties hung by the spikes. Underneath the ties there was nothing but air. There came the rumble of an approaching train. The red flag had blown down.

A small stone culvert was to be replaced by an iron pipe. There was a sufficient interval between regular trains to complete the work. Red flags were posted at the prescribed distances in both directions. A gang of workmen excavated the small fill over the culvert and removed the stone.

At this stage of the work, 15 feet of the steel rails only spanned the opening. From them the crossties hung by the spikes. Underneath the ties, for a height of some 6 feet, there was nothing but air.

There came the distant rumble of an approaching train. It was a "special," and the red flag having blown over, it came rushing on at full speed.

One and all, the workmen dropped their tools and ran headlong into the open field. The foreman ran, too, not venturing to look back, and expecting every second to hear the seemingly inevitable crash.

Finally, at a safe distance, he turned to look.

The special was fast disappearing from sight. It had crossed 15 feet of unsupported rails and continued on its way!

Not only had the locomotive jumped the space, but, to the amazement of all, three cars behind it had safely negotiated the hazardous crossing.

VANCOUVER THEATER BEATS HIGH COST OF GROUND

Ingenious use has been made of a very narrow street frontage by the builders of the new Capitol Theater at Vancouver, B. C., occupied by a motion-picture concern. Frontage on the street in this section, which is the center of the fashionable shopping district, is very high-priced, but a street at the back is a very quiet one, still given over to boarding houses and residences.

A site that was large enough for the new theater was easily obtained there, and the much-to-be-desired access from the busy main street was assured by the purchase of a narrow strip of ground only sufficient for the lofty entrance and lobby. It was necessary, however, to avoid interference with the traffic along the lane which traverses the block, and this difficulty was solved by a combination of sloping walks and stairs, which raise the approach sufficiently, by the time the lane is reached, to leave plenty of headroom underneath for any traffic likely to make use of it.

The effect obtained by this simple arrangement is very satisfactory, for as one steps inside the doors, a vista of fairyland opens out, the decorator having been given a free hand to make the most of the long corridor leading to the theater building proper. To the ordinary sights and sounds of a busy street this quiet and beautiful passage forms a pleasing contrast, and the sense of distance, so rarely obtained in city buildings, is magnified by a succession of arches and the great height of the ceiling. The effect is intensified by the clever disposition of mirrors, and by the series of beautiful candelabra which hang from the ceiling and from brackets on the walls. A short stairway of marble, the full width of the corridor, leads to the entrance of the foyer itself, which, owing to the peculiar construction, is considerably higher than would otherwise have been necessary and gives direct access to the balcony. Other stairways lead to the main auditorium floor.

From Left to Right are Shown: The Frontage of the Theater on the Back Street Where Property Is Cheap; the Front Entrance to the Theater on the Busy Main Street Where Property Is Expensive, and Part of the Approach That Spans an Intersecting Alley without Interference with the Traffic

In the Illustration Above, the Robe is Shown Extended. Notice the Extra Width of the Top Section, Which Allows Ample Covering for the Passengers. These Strips Fold In When the Robe is to be Run Back into the Footrest

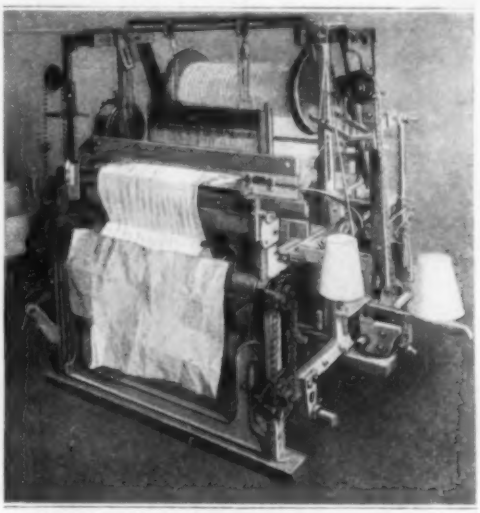
Above: Placing the Robe in the Footrest from Which It can be Run Back and Forth by Means of a Spring Roller. Left: The Footrest as It Looks When the Robe Is Not in Use. A Brass Strip on Top Prevents Scratching

AUTOMOBILE ROBE ROLLS INTO CYLINDRICAL FOOTREST

An automobile robe, recently invented, is attached to a spring roller fastened inside a cylindrical footrest. When not wanted, the robe is easily run back into its container which is shaped like the ordinary footrest and differs only in the larger diameter of the cylinder and in its japanned finish. A heavy brass strip along the top prevents scratching. When drawn out, the top section of the robe unfolds at the sides, allowing ample covering. The cylinder, if desired, can be padlocked to prevent theft of the robe.

BLASTS OF COMPRESSED AIR REPLACE LOOM SHUTTLE

In a new type of loom the shuttle is dispensed with, and its work is done by means of compressed air. A filling-measuring device composed of chains, provided with filling pullers, works in connection with sprockets which are rotated with the loom parts. The filling, wound on large cones, passes through guide eyes in the line of travel of the filling pullers, and sufficient filling is pulled off to make one pick. Then, by means of a cam on the sprocket wheel, the filling is released, and a blast of air from tubes located on the loom lay blows the filling between the warp shed.



In This New Type of Loom, Blasts of Compressed Air from Tubes on the Lay Replace the Shuttle

SMALL DRILL AND MARKER FOR GARDEN USE

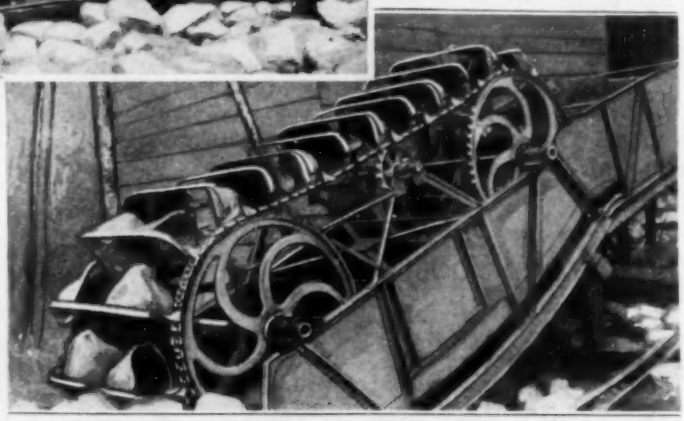
Two Sizes of Garden-Seed Drill, and Three Views of Small Hopper

A foreign implement manufacturer is offering to horticulturists a small drill and marker intended to serve them as the larger seed drill serves the grain farmer. On top is a seed hopper with an opening in the bottom through which the seed is fed out by a revolving shaft having the supporting and marker wheels on its extremities. An adjustable slide regulates the quantity of seed fed into the small trench made by a projection from the body. The trench is afterward covered by means of a hand scraper. The seeder is made in two sizes, one for home gardens, and a larger one for market gardeners. The object is to speed up the planting and secure an even distribution of the seeds.

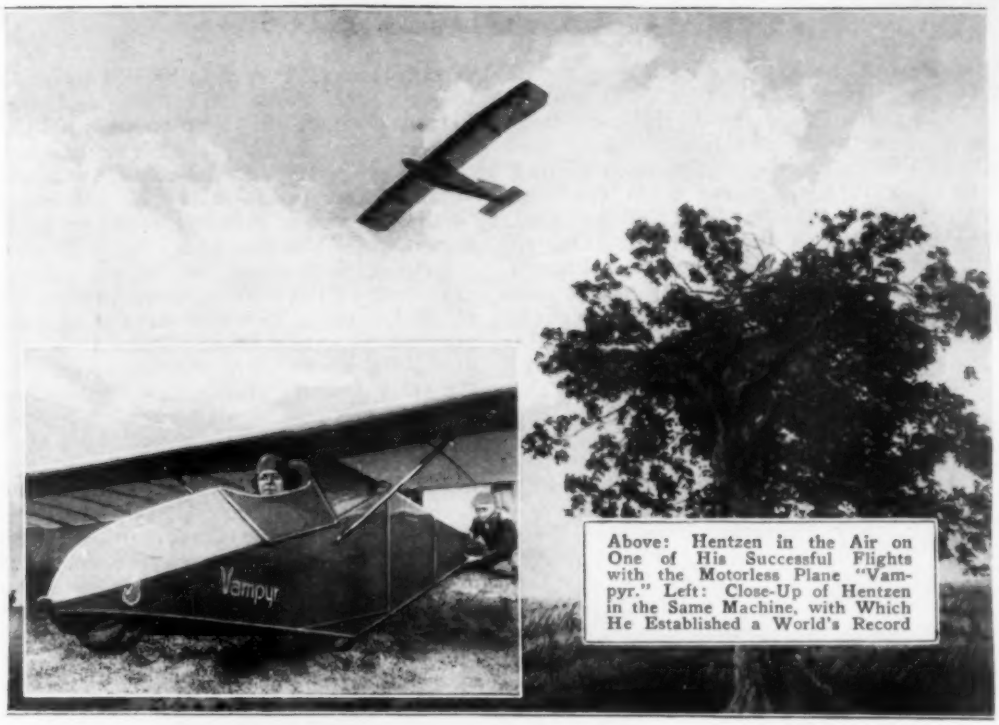
MOTOR FOR LOW WATER HEAD WITH SWIFT CURRENT

Side View of Motor for Use with Low Water Heads and Swift Currents: The End of the Water Flume Is at Extreme Right

A hydraulic motor, specially adapted for use where the water head is low but the current swift, has been constructed in British Columbia. Mounted in bearings on the sides of a water-tight metal extension of the flume that conducts the water to the motor are two large sprocket wheels driven by a chain. Laterally connected to this chain are a series of pairs of buckets, shaped so that the open sides of the buckets face each other in one pair, and in the next pair, are turned away from each other. The rapidly running stream of water strikes the first pair with the full force of its momentum, and is conducted without obstruction to the next pair, and so on alternately to the end of the machine.



Front View of the Motor, Showing How the Open Sides of Alternate Pairs of Buckets are Turned in Opposite Directions



Above: Hentzen in the Air on One of His Successful Flights with the Motorless Plane "Vampyr." Left: Close-Up of Hentzen in the Same Machine, with Which He Established a World's Record

GLIDERS AND SOARING FLIGHT

By R. C. FOLGER

THE world's duration record for gliders—or sailplanes as they are more properly called—was established on August 24 at the German soaring and gliding meet held in the Rhoen hills, when pilot Hentzen, flying the sailplane "Vampyr," cruised about for 3 hours 7 minutes and landed some 1,000 feet above his starting point in apparent defiance of the law of gravitation. This performance equals Wilbur Wright's first public flights in Europe in December, 1908, when he made all previous flights appear insignificant by remaining in the air for 2 hours 20 minutes with his motor-driven machine.

However, the recent achievements in motorless flight, among the most notable of which is that of the Dutch airplane expert Fokker, who stayed aloft with a passenger for nearly 15 minutes, should not be looked upon as anything that will have a tendency to displace or even to any great extent supplement the motor-driven planes, but only as a means of making heavier-than-air machines more efficient. Although some see the possibility of sailplanes taking off from the cliffs of Dover and with a favorable wind flying across the English Channel to the shores of France, the ability of the gliders to keep in the air is so dependent upon suitable wind conditions as to minimize the practical value of soaring in most countries. Without intending to detract from the laurels of the daring and skilled men who are doing so much to advance the art of flying, there can be little doubt the Rhoen hills and the propitious air currents arising from the valleys of the Gersfeld flying field contributed largely to their success.

A study of the conquest of the air takes us back many centuries, and we find the ambition of man to fly manifesting itself in strange man-driven machines with which they threw themselves into the air from the top of a prominent hill or from a tower, usually with disastrous results to the individual. So it was almost down to the present day, when the real era of gliding began as men became convinced that they must learn to fly as well as build the machines. Of this there is evidence in the experiments of the great pioneers like Lilienthal, culminating in the glider trials of the Wright brothers, preliminary to their later successful work with power-driven planes. In this connection it is interesting to note that as far back as 1911, Orville Wright remained aloft in his glider for 9 minutes 54 seconds at their

private field at Kitty Hawk. The recent revival of interest in gliders and soaring flight has led to a more careful consideration of the flight of birds, by which students of flying have always been guided, and especially of those birds that are the best at soaring, like the sea gull, the buzzard, and the albatross. One of these magnificent soarers will sail through the air for a long time with wings motionless and with no apparent exertion, making use of what is often called the "internal energy" in the air. They will cant their wings to take advantage of the little puffs of wind that often carry them sharply upward, only to lose elevation a little later as the puff dies out or they lose momentum. Again flying directly into wind they are forced upward by the moving air. Sometimes, in finding a spiral current of air rising from the surface of the ground or from the sea, they will be carried almost vertically out of sight. Endowed by nature with an instinct for locating and making use of these varying puffs of wind and air currents, these birds are also equipped to utilize them efficiently, and they are provided with enough energy to propel themselves through the air to prevent a fall when they happen into an air pocket or when they approach the surface of the earth. With all the knowledge that man may gain of the air currents and with all his increased skill in the design and operation of sailplanes, it is certain he will never be able to equal the soaring birds, and then he will always be liable to sudden and unexpected descents in planes without some motive power. Some suggest that it is possible that pedal planes or planes of small power will eventually be the solution of this difficulty.

Getting them into the air is another drawback of the gliders or soaring planes. In all the trials of recent days even, it is necessary to start them off from the top of a hill, where they are projected into the air by means of some catapult device or by a number of men running rapidly down the hill and towing them by a cord until the plane has acquired enough velocity to leave the ground, much in the same manner as a kite is sent into the air. After the cord is cut, the plane continues to glide downward under the force of gravity until it gains sufficient speed to produce an upward impulse from the air impact against the properly set wings and horizontal rudder, to offset that force and maintain the plane in equilibrium. The plane may then soar around and even rise above its starting point, depending upon the efficiency of its design, the skill of the pilot, the velocity of the wind, the character of the air currents, and the height from which it started.

In most of the trials in France and Germany, this year, a catapult or huge slingshot was used to start the gliders. The glider that Hentzen flew was given its initial momentum by the use of a long rubber

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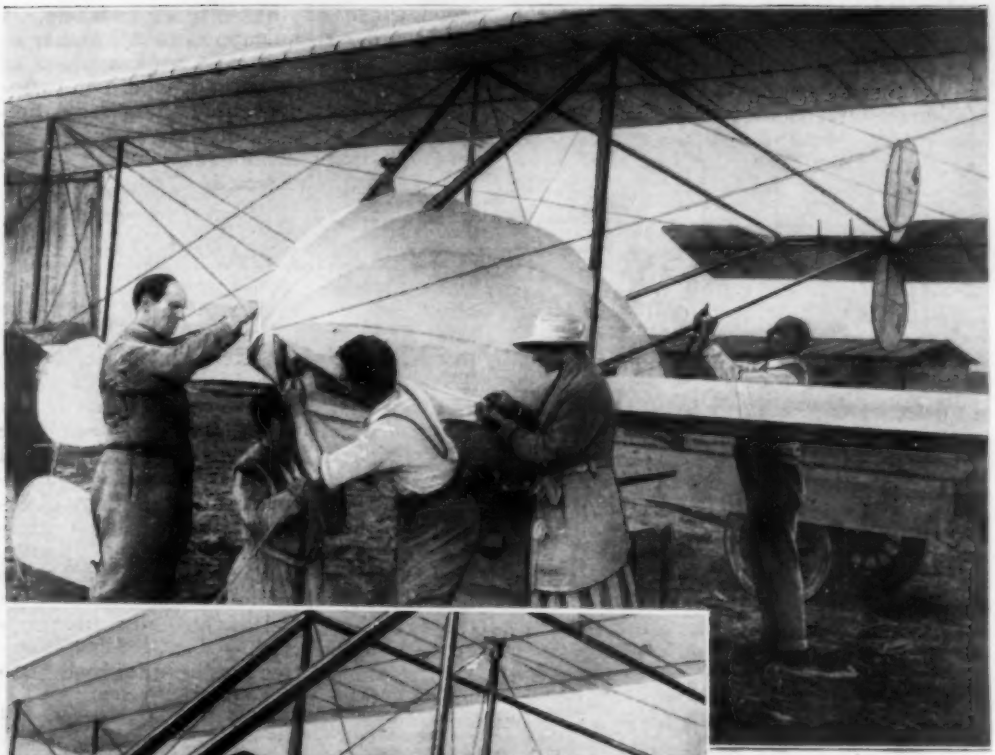
Hydro-Sailplane in Flight over Water: Note the Towline Leading to the Motorboat. It is Suggested That a Powered Airplane may Tow Several Sailplanes

Glenn H. Curtiss and the Hydro-Sailplane Which He Built at a Cost of Less than $1,000: It is Made of Light Metal, and Weighs 140 Pounds



German Women Assisting Fokker When It became Necessary for Him to Renew the Covering on His Biplane Glider, Which Carried Two Persons

The Dutch Expert Fokker Seated in the Glider with Which He Made a Record Flight by Carrying a Passenger: His Assistant with the Camera Was the First to Take Photographs from a Motorless Plane

cord attached to the front of the craft by means of a large hook turned downward and open below. The plane was held steady while six men pulled the rubber cord, and when the command "start" was given, they ran against the wind, releasing the plane, which immediately rose. None of the sailplanes are heavy—varying from 80 pounds to 300 and 400 pounds—and therefore do not require much of a pull, especially when they are in the air, although they are difficult to handle on account of their awkward shape and frail structure.

No less an authority than Glenn H. Curtiss is optimistic over the possibility of water sailplanes to rise from the surface of the sea, in a desire to emulate the albatross. He has lately constructed a motorless glider, weighing only 140 pounds and costing less than $1,000, which has been tested over Hempstead Bay, New York. In a number of attempts, in which the plane was started by towing it behind a fast motorboat, failure to rise was attributed to the dead calm that prevailed. Finally a slight breeze arose and, after being towed about a quarter of a mile at 35 miles per hour, the plane rose 12 feet above the water and remained in the air for 49 seconds after the towline was cut. Mr. Curtiss has visions of a flock of small hydro-sailplanes being towed behind the flying boat of the future.

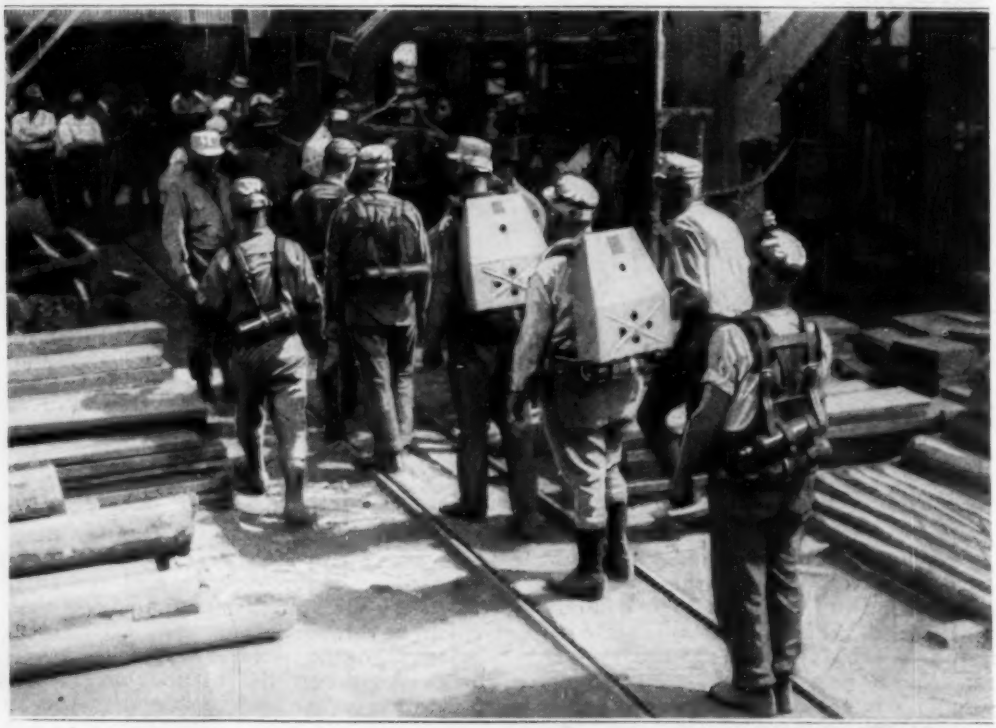
It is of interest to Americans that the only entrants from this country in the glider contests in France and Germany this summer, were three students at the Massachusetts Institute of Technology, headed by Edmund Allen. Before leaving for France, they completed the most successful glider trials held in America since those of the Wright brothers, 11 years ago. Handicapped in a number of ways, these young men took a plane of their own design abroad, where unfortunate accidents prevented them from bettering the very creditable showing they made in competition with the most expert fliers of the world.

HEROIC RESCUE ATTEMPT BY ARGONAUT MINERS

DESPERATE crews of "hard-rock" men and "muckers" battled in shifts for 22 days, in a futile attempt to reach comrades imprisoned nearly a mile below the surface of the earth in the Argonaut mine, at Jackson, Calif. On August 27, fire on the 3,000-foot level trapped 47 men. Rescue parties were immediately sent down but found the flames raging so fiercely that the lower levels, in which the miners were caught, could not be reached. Experienced miners grimly shook their heads.

A plan was hastily conceived, of drilling from the shaft of an adjacent mine so as to connect with the Argonaut, at a point below the fire. Thus began the fight for human lives. To drive a tunnel from the adjacent Kennedy mine, at the 3,600 or 3,900-foot level, meant a drive of more than 300 feet through hard rock and muck. Day after day passed. The grief-stricken families of the entombed men waited anxiously while the half-stripped and sweating miners dug, blasted, and tore their way through the intervening mass of stone and mud. Finally, on September 18, a tunnel connecting the 3,600-foot level of the Kennedy mine with the 4,200-foot level of the Argonaut property was completed.

First-aid parties again advanced into



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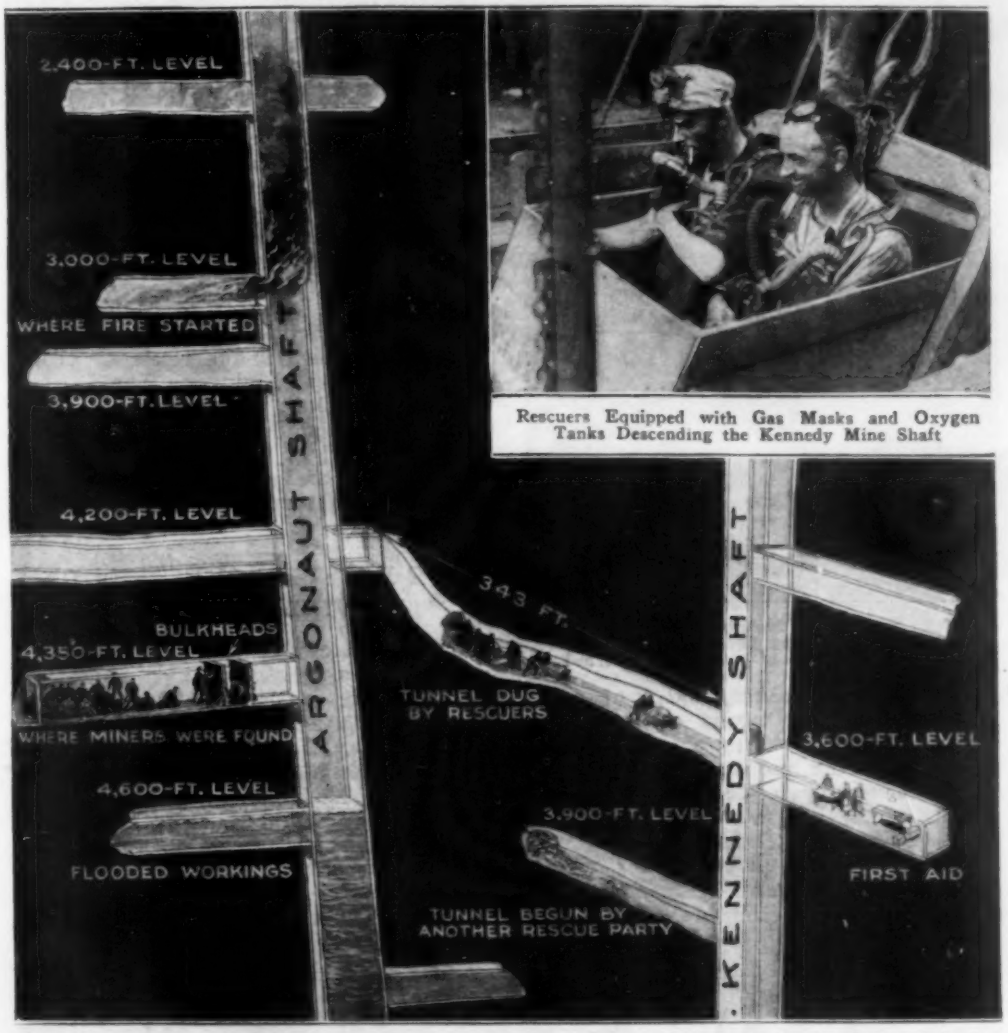
First-Aid Party at the Mouth of the Kennedy Shaft Preparing to Make the Descent to the Tunnel Connecting with the 4,200-Foot Level of the Argonaut Mine, for the Purpose of Exploring the Different Levels of the Ill-Fated Mine to Determine the Condition of the 47 Men Who were Trapped There by Fire. All of Them were Found Dead in the 4,350-Foot Level behind a Double Bulkhead Erected by Them

the ill-fated mine, this time below the impassable barricade caused by the fire, and, after hours of searching among the gas-filled levels, discovered a hurriedly dead. The deadly carbon-monoxide gas had suffocated them. Although the efforts of the would-be rescuers terminated in failure, their devotion to their fellows



Rescuers Equipped with Gas Masks and Oxygen Tanks Descending the Kennedy Mine Shaft

Diagram of the Argonaut and Kennedy Mines, Showing Their Relative Locations: In the Argonaut is Seen the Place in Which the Fire Started on August 27 and below Which the 47 Men were Trapped. The Imprisoned Miners are Shown Building Bulkheads to Keep Out the Deadly Gas. The Rescuers are Seen Digging the Tunnel from the Kennedy Shaft in Which a First-Aid Station had been Established

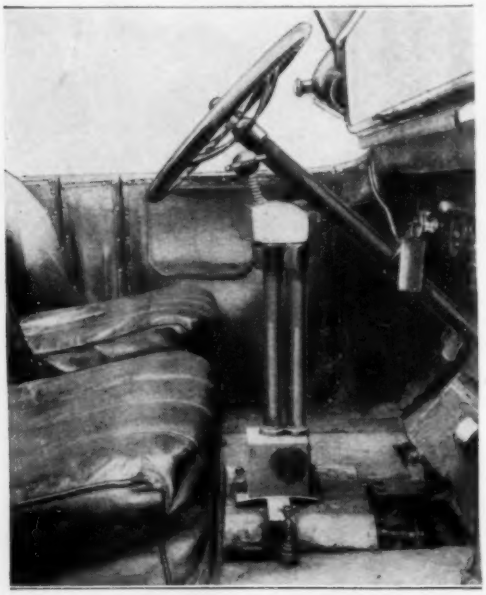
erected bulkhead. This was quickly torn down. The apprehensive searchers proceeded a short distance farther and encountered a second bulkhead, the cracks in which had been stuffed with clothing torn from the trapped miners, thus giving pitiful evidence of the attempt to keep out the suffocating fumes.

This last barrier was likewise battered down and the first-aid party soon stumbled over the miners, huddled together—and their stubborn persistence in their task remain as glorious. Mine accidents seem to occur periodically, and the toll of death sometimes reaches greater proportions than at the Argonaut; but in the display of pure heroism it called forth, no earlier disaster has ever surpassed it.

The country mourns the fate of the 47 miners, but thrills with pride at the recollection of their comrades who expended every human effort in the attempt at rescue.

NEW CONTROL IN MOTOR CARS OPERATES PNEUMATICALLY

Dispensing with the present emergency brake and gear-shift levers in any motor



The Motor-Car Control, Mounted on the Transmission Case, is Operated by the Lever with the Spherical Head at the Side of the Steering Wheel

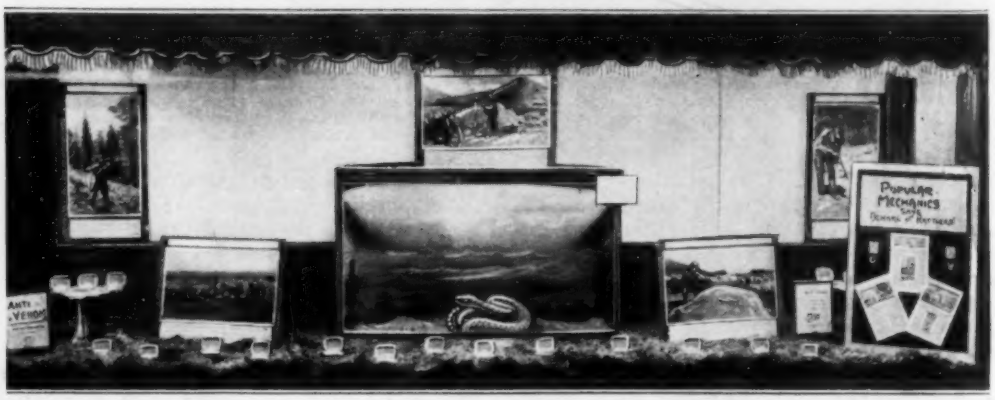
car, the clutch, brakes, and gear shifts are controlled by means of pneumatic pressure of from 40 to 65 pounds, obtained from the motor, in a device of recent invention. The apparatus is mounted on the transmission case in place of its cover, and is operated by means of a small pivoted lever which, when moved backward 45° from the perpendicular, applies the brakes and disengages the clutch. When perpendicular, the lever is neutral, and in this position, by turning a spherical head on top of it and handy to the driver, the transmission gears can be shifted as desired, and as indicated by pointers. To start the car in the selected speed, the lever is pushed forward to an angle of 45°. Reverse is obtained by pressing the lever down against a spring. With the new control it is impossible to strip gears, or to engage the clutch when the brakes are set. The service brake can be set independently of the emergency brake.

JUAREZ-MEXICO CITY AUTO ROUTE BEING PROMOTED

From Ciudad Juarez to Mexico City, following the right of way of the Mexican Central Railroad, is the route of a proposed automobile highway. The El Paso Automobile Club, promoter of the plan, hopes to obtain the needed funds by enlisting the aid of cities along the route, and also is confident of procuring the necessary grant from the Mexican government.

LIVE RATTLESNAKE INCLUDED IN WINDOW DISPLAY

Considerable attention was attracted, recently, to a drug company's window, in which a live rattlesnake was displayed as part of an advertisement for a snake-bite remedy. To obtain as realistic an effect as possible, the cage in which the reptile was confined was provided with a painted background representing a typical desert scene. In addition, the window contained enlarged illustrations taken from an article entitled "Rattlesnake Etiquette," which appeared in the August issue of this magazine.



Window Display of Drug Company, Showing the Live Rattlesnake Confined in a Cage at the Center of the Window: The Background of the Cage was Painted to Represent a Typical Desert Scene

REUSING OLD NEWSPAPERS FOR PRINTING

By FRED L. HOLMES

BULGING waste-paper baskets of discarded newspapers in office buildings, stores, and homes, may become a national asset. The Forest Products Laboratory of Madison, Wis., has announced the discovery of a simple process for de-inking newspapers. Old newspapers are turned back into a pulp, and by the introduction of bentonite, a new American clay, the ink, which rises to the surface when loosened by alkalies, is carried off. The pulp is then put through the old well-known process and again made into newsprint.

Lumps of Bentonite, Which Swells to Several Times Its Actual Size When Soaked in Water, Becoming a Soft Creamy Mass Like Corn-Meal Mush

The same paper can be de-inked several times, there being but a slight deterioration at each process. It requires the installation of no expensive machinery. Bentonite is a highly colloidal clay which exists in large deposits in the intermountain regions of the United States, particularly in Montana and Wyoming. One ton of clay is used to clean 10 tons of paper, and the prices of the clay and the paper make the process a profitable one.

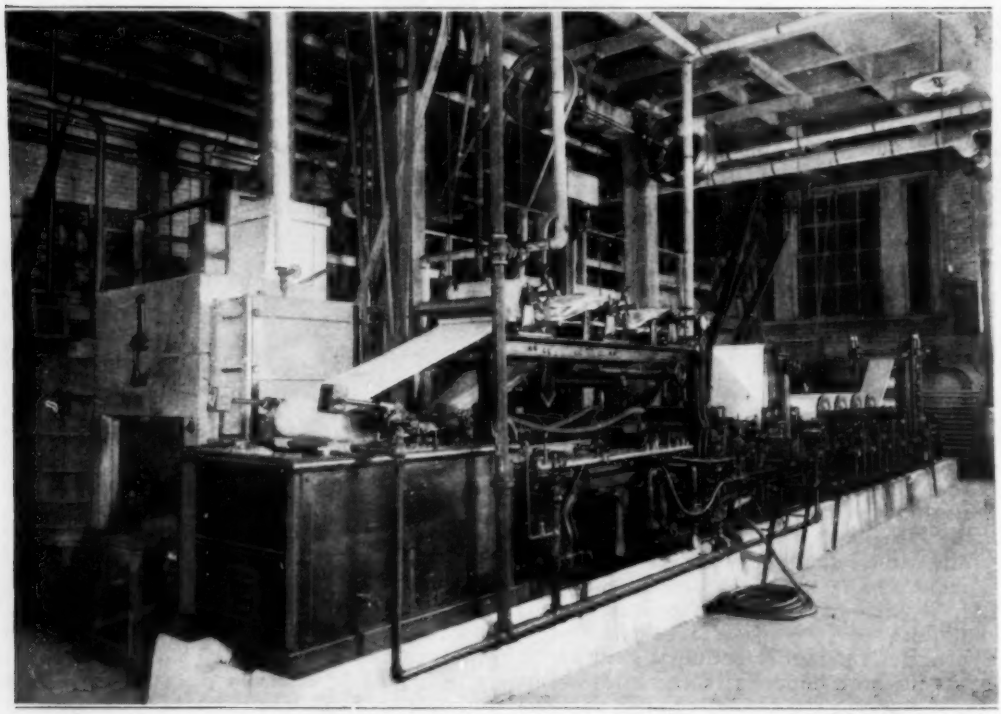
After a series of experiments extending over a year at the Federal laboratory, the process was introduced in a commercial way in some of the large Minnesota paper mills with entire success. It requires about an hour to do the washing. Over 1,500 tons of old newspapers have been de-inked in these plants.

In the Center can be Seen the Large Vat Used in the De-Inking Process and in Which Newspapers are Placed and Reduced to a Pulp; Then, to the Washing Solution in the Vat, is Added the Bentonite Which Removes the Ink from the Pulp

The United States consumes some 2,000,000 tons of newsprint annually, most of which could not heretofore be salvaged for reprinting because no satisfactory de-inking process had been discovered. It has required upward of 5,000,000 cords of wood to meet the annual print-paper demand. It is the belief of laboratory officials that the discovery will materially check this wasting of the timber supply. For this reason, the new process becomes a commercial revelation of great importance in national economy.

Like many another remarkable discovery, this was made while experimenting on something else. When this mineral clay bentonite, creamy-white and smooth in appearance, was first discovered, it was believed that it would be a remarkable substance to use in making the enamel of book paper. One day the engineer at the laboratory placed some of the clay in the vat of murky old-newspaper pulp that was being run through the beater. At once the sooty particles began to float off through the waste-pipe sieves. That was the beginning of 13 months of experiments in laboratory and commercial plants, with the result that business men pronounce the discovery a success.

Bentonite is defined by the United States Geological Survey as a transported, stratified, volcanic ash that has been altered shortly after deposition. It is very fine-grained and has the property of swelling in contact with water to several times its original volume into a jellylike mass, which on further dilution forms colloidal solutions and will remain in suspension indefinitely in mixtures as dilute as 1 part of bentonite to 50 parts of water. Like any natural product, different deposits differ considerably, and the finest-grained, or most colloidal, occur in Wyoming, although samples from many deposits in the state proved to be low in colloidal content. Samples freshly taken from the quarries are of a

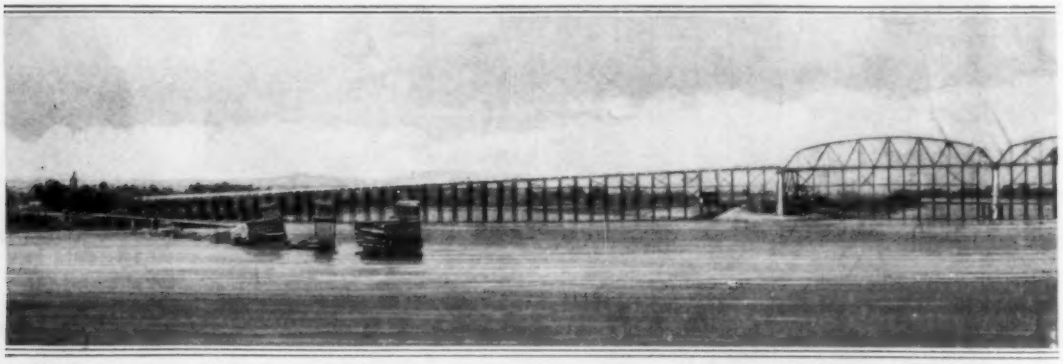


Paper Mill at the Forest Products Laboratory in Madison, Wisconsin, in Which Paper of White Texture is being Manufactured from the Pulp of Old Newsprint Paper Treated by the Bentonite De-Inking Process

greenish-yellow color, but on exposure to the air become light cream. It is a mineral akin to kaolin, although generally yielding on analysis more silica, less alumina, and more magnesia, and has been found to be an excellent filler for paper. It is its physical properties, however, that render it of most value in de-inking paper, and of these, fineness is of most importance.

LAST FERRY ELIMINATED ON YELLOWSTONE TRAIL

The elimination of the last ferry on the transcontinental Yellowstone Trail is being accomplished by the erection of a steel bridge over the Columbia River between the towns of Kennewick and Pasco, in Washington. The former method of crossing the river, with its invariable and irritating delays, together with a universal

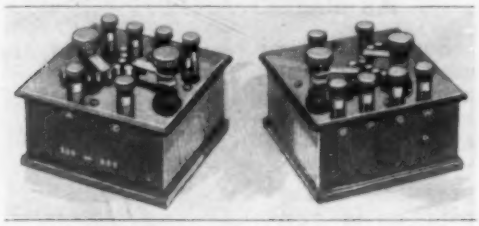


Partly Finished Steel Bridge over the Columbia River between the Towns of Kennewick and Pasco, in Washington, the being Planned for the Formal Opening. This Bridge Has a Clearance, above the Water, Approximately 30 Feet in Depth at the Channel Piers, the Bot

desire for progress, caused the long-suffering citizens in that vicinity to demand a bridge. Subscriptions to the amount of $500,000 were successfully solicited from interested persons along the trail between Seattle and Spokane, and construction started just one month after the necessary funds were raised in 1921. The completed structure, with the approaches, will be a half mile long, will have a 20-foot roadway, a center opening of 430 feet from pier to pier, and a clearance at high water of 50 feet.

TUNER FOR RADIO RECEIVING LIGHT AND COMPACT

That it weighs only 2 pounds and tunes to wave lengths of 100 to 600 meters, are merits claimed for a small and compact instrument which was given a practical test by the navy during the late war. Much of its efficiency is due to the minimum of space required. It is also said that the peculiar design of this tuner prevents, to a great extent, the interference by "strays" and static. "Fool-proof"



Radio Tuner Which Is of Light Construction, Thus Making It Adaptable for Portable Receiving Sets

features are incorporated which make it desirable for portable sets, Boy Scout outfits, or for simplified sets such as used by farmers in receiving the government market reports.

TRAFFIC SIGNALS OPERATED FROM SIDEWALK

Electrically operated signals which are controlled from the sidewalk are the latest improvements for the traffic police of Chicago. The signal is located near the curb and mounted on an iron post, at the base of which is placed the control mechanism. When on duty, the traffic officer stands at the edge of the sidewalk and by manipulating the different switches, flashes the "stop" and "go" signs as occasion demands, thus directing the flow of traffic.

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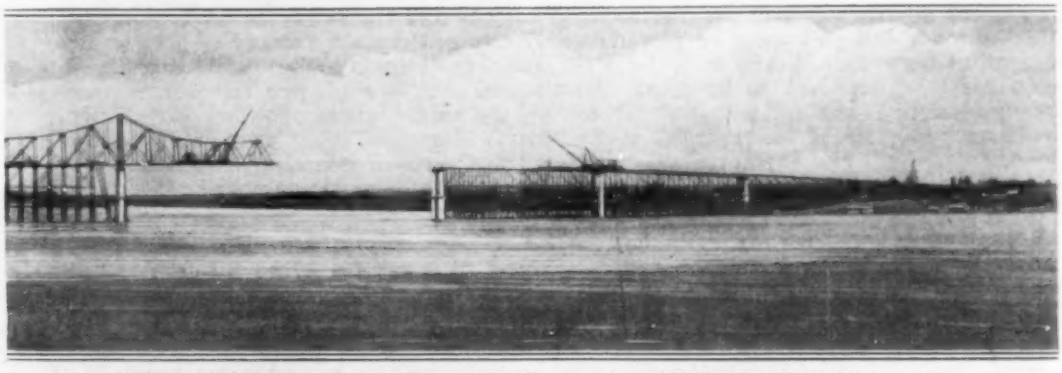
Electrically Operated Traffic Signal Which is Controlled from the Curb by Means of Switches



Completion of Which will Eliminate the Last Ferry on the Transcontinental Yellowstone Trail: Elaborate Ceremonies are of 50 Feet, Thus Doing Away with the Necessity of Having a Drawspan. The River Is toms of Which are Sunk 20 Feet below the Bed of the Stream

TWO MAY SIT SIDE BY SIDE ON NEW MOTORCYCLE

Two persons may sit side by side on a new motorcycle having separate "saddles" and double sets of handlebars, the latter being attached to the frame at a point just behind the front fork. Individual footrests are likewise provided. Thus, while comfort in riding is assured the transcontinental tourists, or casual "joy riders," the narrow width of the outfit, in comparison with that of the usual sidecar and third wheel, permits the owner to economize space in the garage.

Motorcycle Which Accommodates Two Persons Seated Side by Side, Showing the Odd, but Comfortable Footrest and Double Handlebars

DRAWING ROOMS EN SUITE ON TRAINS TO COAST

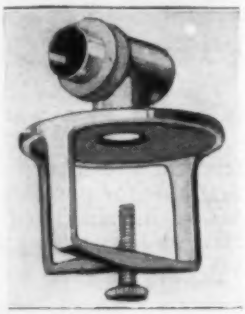
Steel sleeping cars, containing seven drawing rooms, and so arranged with sliding doors that they can be used en suite, are now being built for the Santa Fe Railroad, and will soon be placed in operation between Chicago and the Pacific coast. There are to be 18 of the newly designed cars. Each room is to have an upper and a lower berth, a day lounge and bed, and lavatory and toilet equipment. The new sleepers will be part of $3,500,000 worth of steel equipment planned for the regular daily passenger service of this company.

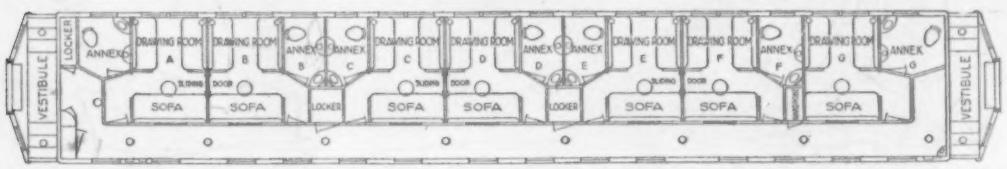
ACROSS U. S. IN RECORD TIME ON ONE-STOP FLIGHT

On September 5, Lieutenant Doolittle, army flier, landed in San Diego, Calif., about 22½ hours after he left Jacksonville, Fla. Stopping only once, at San Antonio, Tex., for fuel and oil, he averaged better than 100 miles per hour during the 21 hours 19 minutes that he was in the air. The 400-horsepower Liberty motor which drove his DeHaviland plane, consumed 399 gallons of gasoline and never missed a stroke on the 2,165-mile flight. In the early hours of his trip the lightning flashes of a thunderstorm he encountered, served to illuminate landmarks along the route. The only other incident was an attack of drowsiness while he passed over the monotonous plains of the Southwest.

USE PHONOGRAPH SOUND BOX AS RADIO AMPLIFIER

Sound boxes of phonographs may be used as radio amplifiers, by the attachment of a simple "adapter" to the tone arm of the machine, after first removing the reproducer. The appliance is constructed of a non-magnetic alloy. When the adapter has been fitted to the tone arm, one receiver is placed inside—the other being short-circuited—and tightly clamped there by means of a setscrew. In thus bringing the total volume of sound out through one receiver, instead of the sound waves opposing each other, as is the case when two receivers are used, the result is a clear and mellow reproduction of music or voices.





This Diagram of the Steel Sleeping Cars Soon to be Placed in the Transcontinental Service of the Santa Fe Railroad Shows How the Rooms are to be Arranged. Notice the Sliding Doors between the Drawing Rooms

TYPEWRITING BY RADIO

Typewritten Messages Sent from Airplane to Earth—Secret Radiograms Safeguarded by New Adaptation of the Printing Telegraph Machine—Business Methods Also Benefited by Invention

By H. A. LANE

ANOTHER chapter has been added to the wonderful story of radio. So many and so remarkable have been the adaptations of this method of communication, that the interested observer of the world's progress scarcely has the time to familiarize himself with one mode before another appears. The latest achievement is the sending of typewritten messages through space. This feat has been accomplished through the efforts of radio experts working in conjunction with the Navy Department, who have thoroughly demonstrated its practicability for scout

Printing Telegraph Apparatus of the Page-Form Type Which Performs the Double Function of a Sending or a Receiving Machine

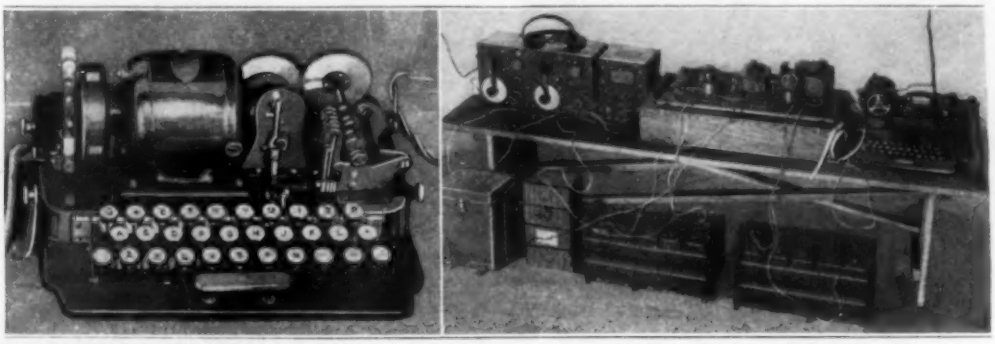
and battleplanes in time of war. Also, radio typewriting represents added efficiency for business methods.

To the casual onlooker, the sending apparatus of the outfit resembles the ordinary commercial typewriter of the portable kind; that is, as far as the keyboard is concerned. The usual radio equipment

Central-Station Sending Machine of the Printing Telegraph Outfit, on Which the Messages are Typed in Page Form

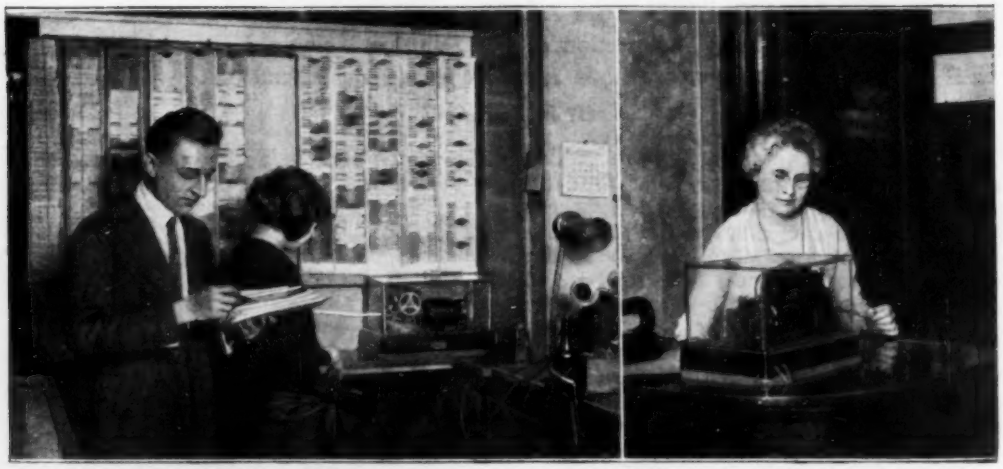
is carried on the plane, and in addition to this, the keyboard mechanism of the typewriter is installed in such a manner as to control the modulation circuit of the electron-tube transmitter. Thus, when a letter is struck on the keyboard, an impulse is sent out and received at a station on the ground. The receiving station, of course, has similar equipment to that on the plane. When any particular letter or number is depressed on the keyboard of the sending apparatus, a certain radioactive energy is released from the antenna of the plane and travels through the air. This is the common nature of radio.

Before any station can intercept these impulses, however, and decipher them, it is necessary to possess the same delicate



OFFICIAL PHOTOGRAPHS, U. S. NAVY

At the Left is Seen a Keyboard Transmitter of the Radio-Typewriting Apparatus Which is Carried on Airplanes, While on the Right is Shown the Wireless Equipment That is Installed in the Ground Station



On the Left is Seen a Printing Telegraph Machine, Installed at the Mail Clerk's Desk in a Hotel, While at the Right is Shown a Similar Machine Mounted on the Desk of the Room Clerk, by Means of Which She may be Informed, for Instance, That a Certain Room has Just been Vacated and Needs Clean Linen

and complicated apparatus that is used on the plane. Thus the messages are secret. As a further precaution, the keys on the sending machine may be arranged in different sequences, so as to emit different impulses, the change of letters being previously understood, of course, by the station to which the messages are being sent. Any change in the sending keyboard would have to be duplicated in the receiving instrument.

Telephone Operator in a Hotel, Transmitting Messages to Various Stations through the Medium of the Printing Telegraph Machine

The value of this invention in the transmission of secret orders and reports, during the maneuvers of an army or fleet in war time, is thus clearly apparent; no less is its efficiency in the commercial world. Hotels, department stores, police and fire departments, in short, any organization that directs a large force of employes from a common center, may be benefited by another adaptation of this machine, which operates similar to the telegraph except that the messages are printed on a tape instead of appearing in code. It is, in reality, a printing telegraph. Hotels operating under this latter system, have an efficient method of catering to the interests of the guests by giving rapid service, of which the following supposition might serve as an instance.

A room occupant notifies the switchboard operator of his intention to leave hurriedly. The guest requests that his laundry, baggage, and mail be taken care of, and that a taxicab be ordered to take him to the railroad station. The telephone attendant immediately sends a message via the printing telegraph machine. This message is received simultaneously by the laundry, baggage, and mail clerks, the cashier, taxicab stand, and the captain of the bellboys. The hurrying traveler descends to the desk to pay his bill, and is extremely gratified to find everything in readiness for rapid departure.

In the meantime, the hotel management, as stated above, also derives benefits from this system in another way than merely by having pleased the late guest. The original message from the switchboard operator's machine is received by the floor clerk, whose duty it is to see that the vacant room is quickly made ready.

with clean linen, etc., for the accommodation of the next guest, who may even at that moment be impatiently waiting downstairs in the lobby for a room. Thus is the efficiency of the modern hotel increased.

Although these first machines were constructed so as to print the messages on a narrow tape, one of a later type prints on a full-sized sheet of paper, or letterhead. The advantages of this are numerous. All messages sent out from a central source appear at the receiving stations in suitable form for filing purposes. If the message is desired in duplicate or triplicate form, carbon copies may be made as with the ordinary typewriter. This page-printing machine has been chosen by the Police Department of Chicago. One sending apparatus, installed at central headquarters, delivers simultaneous instructions to 40 outlying stations, thus doing away with numerous telephone conversations, with their attendant risk of misinterpretation. Irritating and everyday errors are consequently eliminated, and by the elimination of mistakes, activities of all kinds are naturally accelerated.

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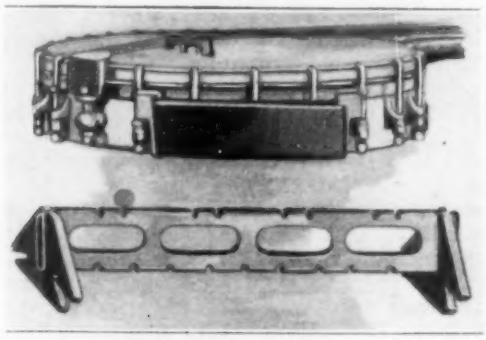
Sending Machine of the Printing Telegraph Outfit at Central Headquarters of the Chicago Police Department, with Which Page-Form Typewritten Messages are Sent to 40 Outlying Stations

Although the radio typewriter and other adaptations of the printing telegraph machine are still undergoing development, it is reasonable to assume that this method of communication will add to a nation's prosperity in times of peace and safeguard it in time of war. At any rate, the invention stands as a noteworthy addition to the practical application of wireless.

ADJUSTABLE BANJO BRIDGE AND CLOTHING GUARD

Two banjo accessories, a clothing guard and an adjustable bridge, are now available. The former consists of an elastic pad which fits over the brackets and nuts of the instrument, thus preventing any wear and tear on the garments. The latter may be adjusted to different heights and has notches of various depths, on both sides, by means of which all members of the banjo "family" can be accommodated.



At the Top is Shown the Clothing Guard for Banjos, While at the Bottom is Seen the Adjustable Bridge with Many Notches

GULLS DROP CLAMS ON ROOFS TO BREAK THE SHELLS

Sea gulls congregating near Port Angeles, Wash., are fond of eating clams. The shells, however, proved difficult to open until, either through accident or ingenuity, the gulls carried the clams to a considerable height and dropped them on pavements or roofs, thus breaking the shells and getting a goodly meal. The roof of one building near the water's edge has been so badly damaged, it is said, that it is leaking. On another, wire netting has been put over the skylights to prevent their destruction.

NEW NAVY AIRSHIP-MOORING MAST

By ERNEST JONES

THE mooring of the gigantic airship of today when arriving in port or departing, is not radically dissimilar to the docking of large ocean liners. For the pull and push of panting tugs there are substituted a mooring mast, winches, and a small crew of men. There is no river traffic, low tide, or the want of a pilot, to delay arrival at the scheduled hour.

The ship of the air gracefully approaches the mooring tower—or mast, to be technical—from the leeward and lets go her main hauling line. This is then connected by the ground crew to a line from a hauling winch by means of a coupling, and the ship is gradually pulled toward the head of the mast by electric power.

After the hauling in has begun, and when the bow of the ship is near the circle of snatch-block anchorages, two guy lines are dropped and connected to corresponding lines from auxiliary winches. These lines are led to snatch blocks which lie at 60° each side of the direction of the wind, and thence, by such lead blocks as may be necessary, to the auxiliary winches. These latter are operated until a mark on each line appears at the corresponding snatch block, when the auxiliary winches are stopped, the lines being simply held, and the main hauling line continues to draw the ship forward and down until the cone on the ship's nose enters the receiving member, mounted on a gimbal at the top of the mast, where ultimately it is locked in place, and the ship rides to the structure of the mast alone.

The passengers, baggage, and freight may then pass over a gangplank laid down from the corridor in the keel, through the underside of the nose, to the main platform of the tower. From another platform, a few feet below this, an elevator operates.

In leaving, the ship is trimmed sufficiently light to rise as soon as it is released from the mast, the releasing hook is opened, the ship rises, and the mast is again ready to receive.

Just completed at Lakehurst, N. J., the mooring mast of the United States Navy airship station is the tallest in the world, and the first to be erected without guy wires. It consists essentially of a triangular steel tower, somewhat similar to that of a radio station, in the center of a circle of 48 snatch-block anchorages at equal intervals of 7½°. The radius of this circle is 500 feet. Additional anchorages for snatch blocks or fair-lead sheaves are located about the base, to make it possible to lead two lines from any of the two guy-line snatch blocks, 120° apart, to the two auxiliary winches in such a direction as to feed properly.

At the base of the tower is a building for housing 4 officers and 20 men, with an office, elevator entrance, and the winches for the lines used in bringing the ship to the mast, together with the pumps for water, fuel, and oil.

The elevator runs in an interior rectangular framework to a platform 136 feet above the ground. Twelve feet above this is the main operating platform, reached by stairs; and at 160 feet is the gimbal of the main swinging tube.

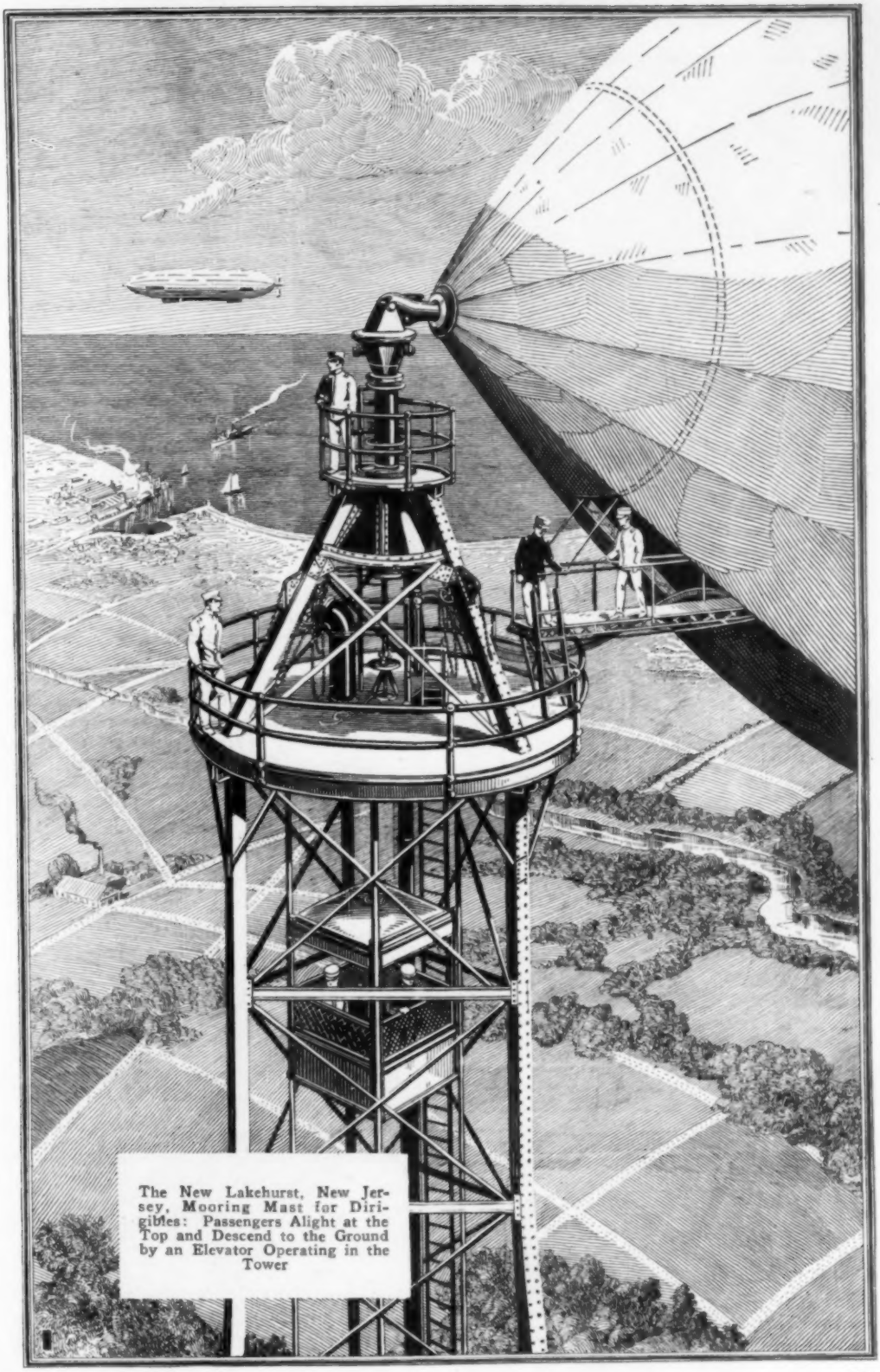
Up the tower, lead the pipe lines: one for water, delivering 18,000 pounds in an hour; fuel is pumped at 1,500 gallons an hour; a 12-inch pipe, with fabric tube to the ship, supplies 300,000 cubic feet of hydrogen or helium gas. An electric system is provided for night arrivals and departures; and there are, of course, telephones.

On the uppermost platform is the gear for receiving and securing the ship, together with the connections for the water, gasoline, oil, and gas piping which couple to the ship's lines.

This receiving gear consists, in short, of a revolving steel cup on bearings, mounted on gimbals, with a spring device to take up shock at the moment of securing the cone of the ship in the cup, and a locking device.

TWO CITIES EXCHANGE POWER AS EMERGENCY MEASURE

The electric generating systems of Tacoma and Seattle, in Washington, have been "tied" together to safeguard each city against lack of power during unusually high demands or emergency conditions of any kind. Each municipality generates power at approximately 50,000 volts. The maximum amount of current to be exchanged is 15,000 kilovolt-amperes, and a water-cooled transformer of this capacity is used to tie the two systems together. The scheme is simple in operation. One side of the transformer is provided with a number of taps, through the medium of which any desired amount of the current, or all of it, can be interchanged from one set of lines to the other. The amount of the power interchanged is controlled by an induction regulator operated by two push buttons.



The New Lakehurst, New Jersey, Mooring Mast for Dirigibles: Passengers Alight at the Top and Descend to the Ground by an Elevator Operating in the Tower

Some Ornamental Signposts Erected in England: The Carvings are Inspired by Local Associations. From Left to Right They Represent, Famous Knight and Dame; Local Legend, and an Event in Early Church History

USING BIRCH WOOD FOR FUEL COMMON IN SWEDEN

Coal strikes would have little effect upon domestic heating in Sweden, for the most common fuel in that country is birch wood. The logs are usually cut up in winter, when the pieces are piled in large stacks to dry until the next fall. The fireplaces are so constructed as to store the heat, and practically none of it is wasted.

These Stacks Consist of Birch Wood, a Common Fuel in Sweden. They are Left to Dry for Several Months Before the Wood is Used

HISTORICAL CARVINGS ADORN SIGNPOSTS IN ENGLAND

That road signs can be made ornamental as well as useful is evident from the examples of some that have been erected on King George's Sandringham estate, in the county of Norfolk, England. Above the ordinary direction signs are mounted very elaborate and decorative designs depicting historical personages and events connected with the locality. Skillfully carved and solidly built, these artistic creations may represent an armored knight mounted on his prancing steed, some legend associated with the name of a neighboring town, or an event of early church history. They are unusually large for signposts, and very conspicuous.

TALKING-MACHINE NEEDLE SIX FEET IN LENGTH

Measuring 6 feet in length, 7 inches in diameter, and weighing 10 pounds, the largest talking-machine needle in the world occasions great interest wherever it is placed on exhibition. The huge innovation, constructed entirely of steel in two telescoping parts, is more than 100 times the size of the ordinary needle used for playing records, and was manufactured by an Indiana concern solely for window-display purposes.

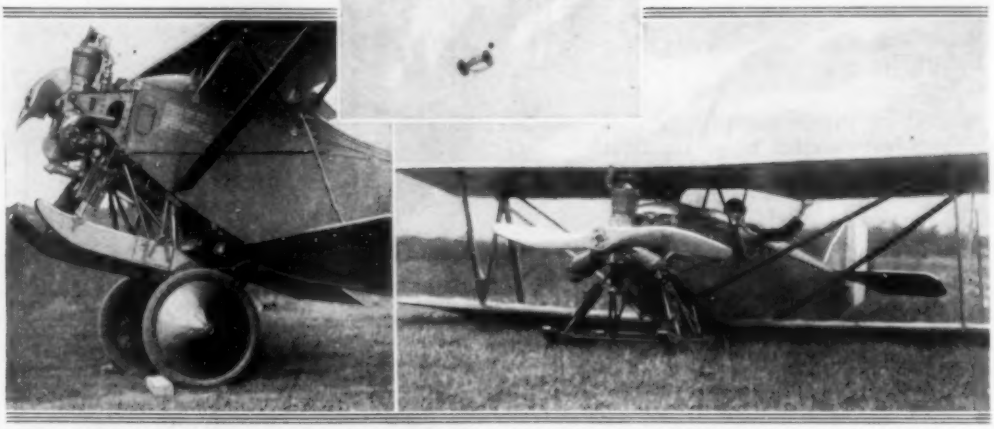
ODD-APPEARING VEHICLE OPERATED LIKE BICYCLE

How to transport himself and family of five children at the same time, was the problem encountered by a European father of limited means, in the solving of which considerable ingenuity was displayed. Taking the wheels, gears, pedals, and chains from two bicycles, he constructed a strong frame, axles, and steering apparatus. Four wicker baskets, having a combined seating capacity of six persons, were then mounted on the vehicle, and now, with his eldest boy aiding in the pedaling, the father and five youngsters jointly partake of pleasure trips.

Odd-Appearing Vehicle in Which the Entire Family may be Transported, Showing the Clever Pedal Arrangement and the Wicker Baskets Used for Seats

AIRPLANE LANDING GEAR DROPPED IN FLIGHT

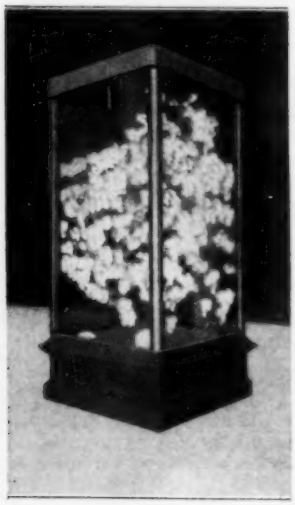
A recent invention permits the conventional landing gear with rubber-tired wheels to be dropped from a plane in flight, the subsequent landing being effected with a pair of skids mounted beneath the plane. The object is to eliminate the weight and wind resistance of the usual landing gear and to make possible landings in a short space and on rough ground. Landing on water is safer with skids than with the wheels because of the lowered center of gravity, which reduces the tendency to turn the machine over on its end. The arrangement of shock absorbers, some of which are double-acting, interposed between the skids and the body of the plane, is one of the most important features. In this design the propeller blades must be horizontal when making a landing.



Above: Dropping the Wheel Landing Gear from a Plane in Flight. Left: Airplane Equipped with Combination of Regular Wheel Gear for Leaving the Ground, and Skids for Landing. Right: Making a Landing on Skids, Which can be Done in a Distance of About 50 Feet

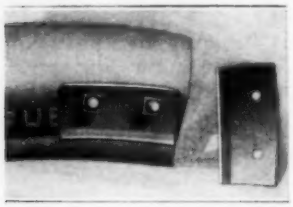
RECORD STALK OF COTTON HAS 700 BOLLS

A cotton stalk, bearing 700 bolls and standing 5 feet 6 inches in height, was grown recently on a plantation in Georgia. As far as is known, this is a record number of cotton bolls to be grown on one stalk. The extraordinary growth, which is of the double-jointed variety that produces two bolls to the joint instead of one, has been placed in a glass case at the capitol in Atlanta, where it will remain as a permanent exhibit for the benefit of sight-seers.



SHEET-STEEL TIRE PLATES FOR MENDING RIM CUTS

A tire plate for mending rim cuts, made of the best sheet steel, is stamped to fit the tire and flanged to hook over the edge of the rim. The plate is about 2¾ inches long, and is drilled with two holes for small flat-head bolts with self-locking washers that go inside the tire. A belt punch is used for making holes in the tire that correspond to those in the plate. If the rim cut is long, two or more of the plates are placed side by side. They are made to fit both clincher and straight tires.

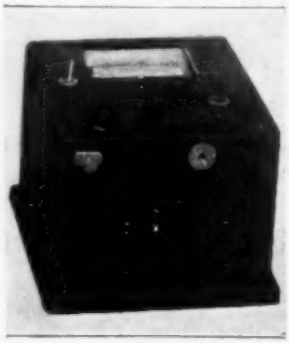


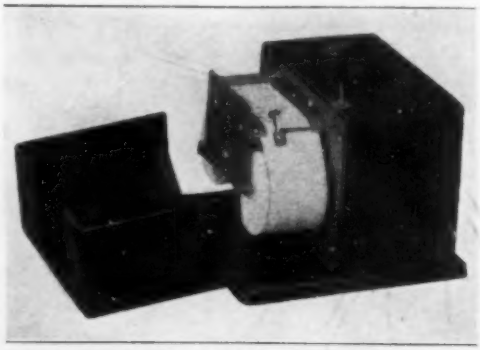
CAUTION USERS OF HARD-COAL SUBSTITUTES

Persons intending to use soft coal, wood, kerosene, or other fuels as a substitute for anthracite, are warned that extra precautions are necessary for their safe usage, in a bulletin issued by the National Board of Underwriters. Smoke-pipes and flues, states the bulletin, should be thoroughly cleaned before the furnace is started. Oil stoves should not be moved while lighted, and at all times should be kept away from inflammable household furnishings such as curtains. Office managers are advised to give special attention to their sprinkling systems so that they will not freeze from insufficient heat.

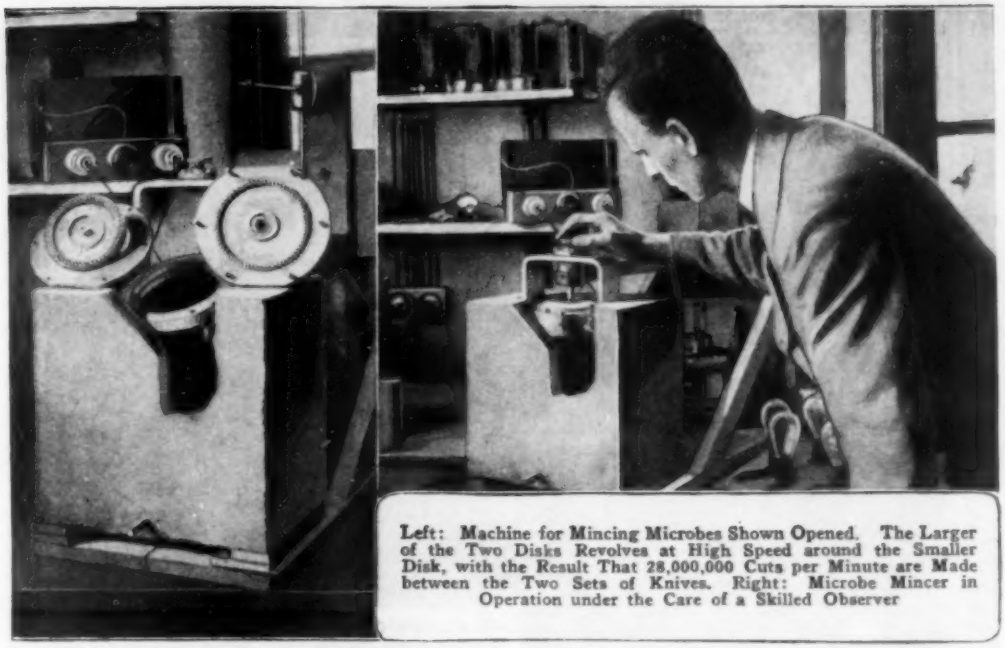
NEW MACHINE FACILITATES TIME-STUDY WORK

A recently marketed machine times and makes permanent records of time-study observations. A strip of paper, positively driven, is moved at a uniform speed that can be adjusted to suit conditions. A pen, suitably mounted to trace a line on the paper, is caused to move back and forth across the strip by two finger keys at the option of the observer, who presses one or the other of these keys at the completion of each element of the cycle. The machine is small, weighs only 9½ pounds, and is driven by a clockwork motor, so it can be easily carried about. It is more accurate than a stop watch, observations as low as .001 minute having been recorded, and the 24 steps obtainable provide for a record of all the data usually required.





This Time-Study Machine is Controlled by Two Finger Keys, and the Operator can Observe the Worker



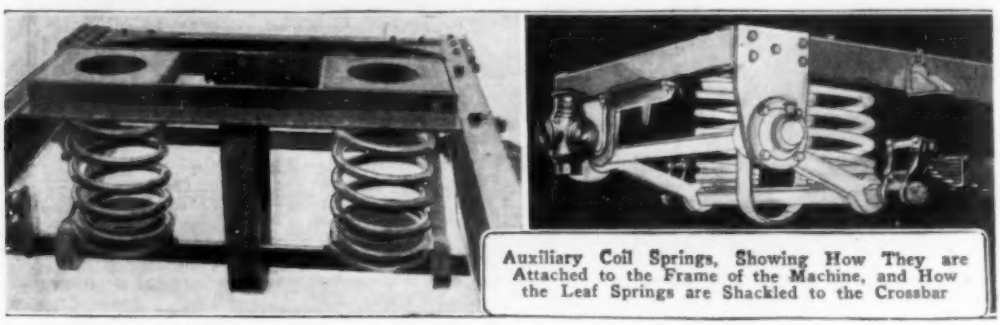
Left: Machine for Mincing Microbes Shown Opened. The Larger of the Two Disks Revolves at High Speed around the Smaller Disk, with the Result That 28,000,000 Cuts per Minute are Made between the Two Sets of Knives. Right: Microbe Mincer in Operation under the Care of a Skilled Observer

MACHINE MINCES MICROBES USED FOR VACCINE

An interesting little machine is used for mincing microbes in the laboratory of a London hospital. This electrically driven machine consists of two disks, of which the smaller or stationary one has 70 small steel knives and the larger or rotating disk has 80 cutting edges. The microbes, suspended in an alkaline solution, are forced against the cutting edges at a speed of 60 miles per hour, and during the 20 minutes they usually remain in the machine receive 560,000,000 cuts. But while some microbes are properly cut by this machine, others are so tough that they come through it whole and sound. A machine is therefore being constructed with 450 cutting edges, which will whirl the microbes at the rate of 120 miles an hour, giving 500,000,000 cuts per minute. The object is to remove the poisons from the germs so that a larger quantity can be administered to the dose of vaccine, giving greater protection against the particular disease.

AUXILIARY COIL SPRINGS FOR MOTOR TRUCKS

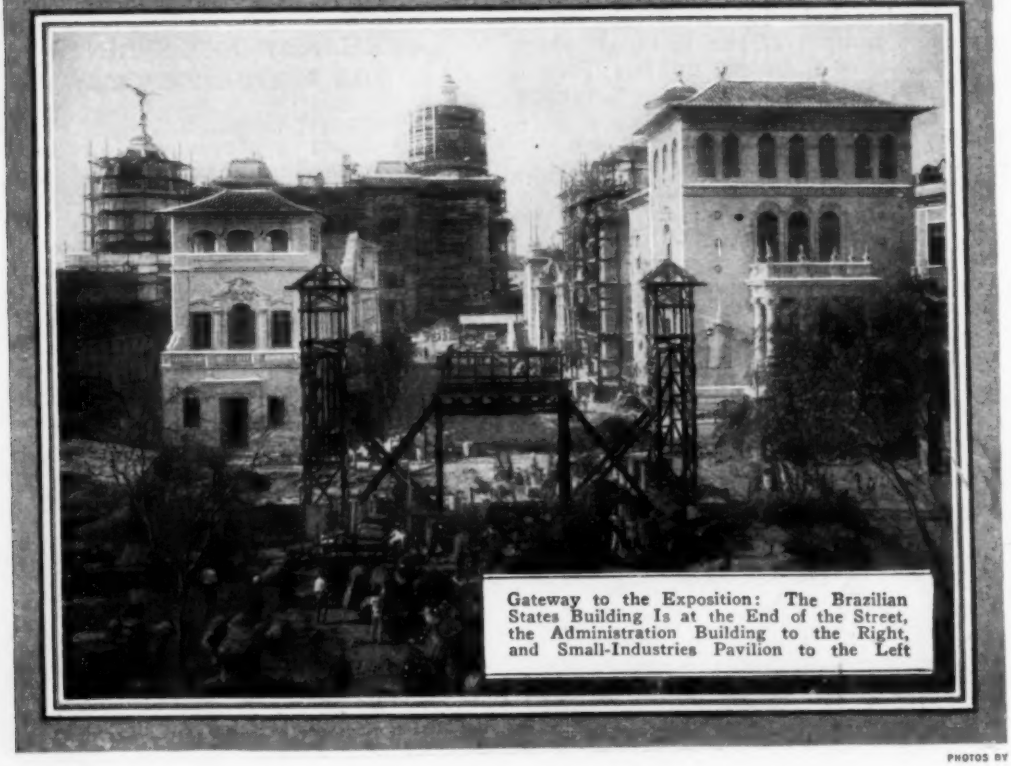
Auxiliary coil springs for motor trucks are the latest improvement introduced for the purpose of reducing the jarring when driving over rough roads with solid tires. The rear ends of the ordinary leaf springs of the car, instead of being shackled to the frame, are fastened to a crossbar on which are placed two coil springs. The frame of the machine rests upon the top of these coils, which are limited in movement, except as to up and down, by a hinged arm affixed to the crossbar.



Auxiliary Coil Springs, Showing How They are Attached to the Frame of the Machine, and How the Leaf Springs are Shackled to the Crossbar

EXPOSITION BUILDINGS AT RIO DE JANEIRO

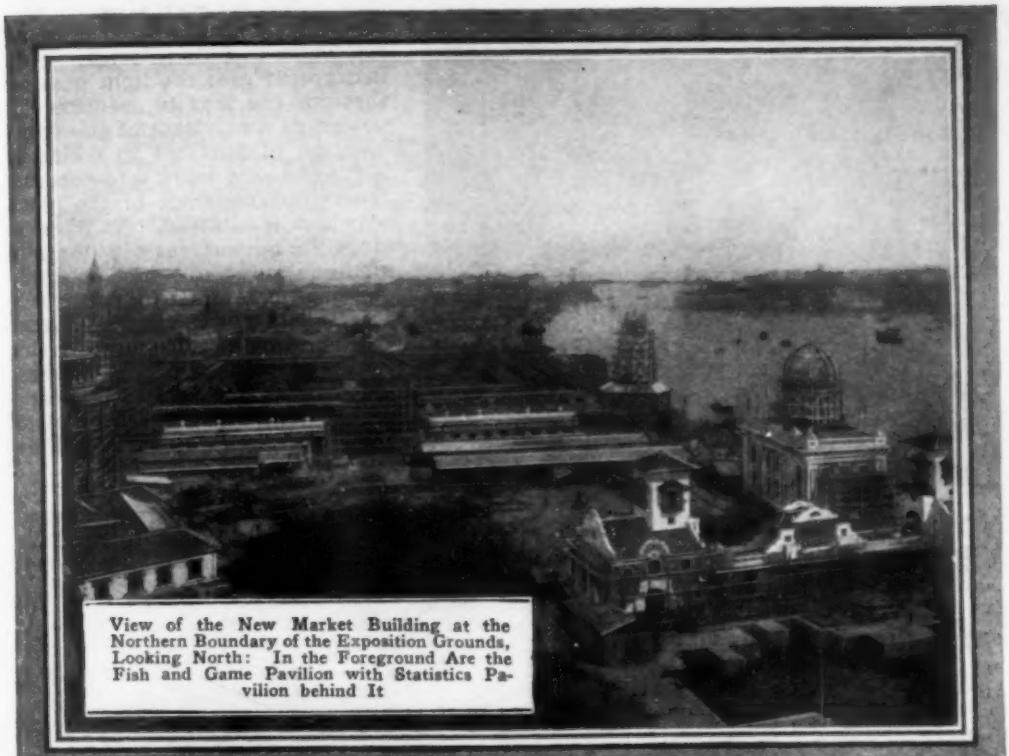
Part of the City of Rio de Janeiro, Showing Entrance to the Harbor: The Exposition Grounds and the Main Part of the City Are to the Left of This District



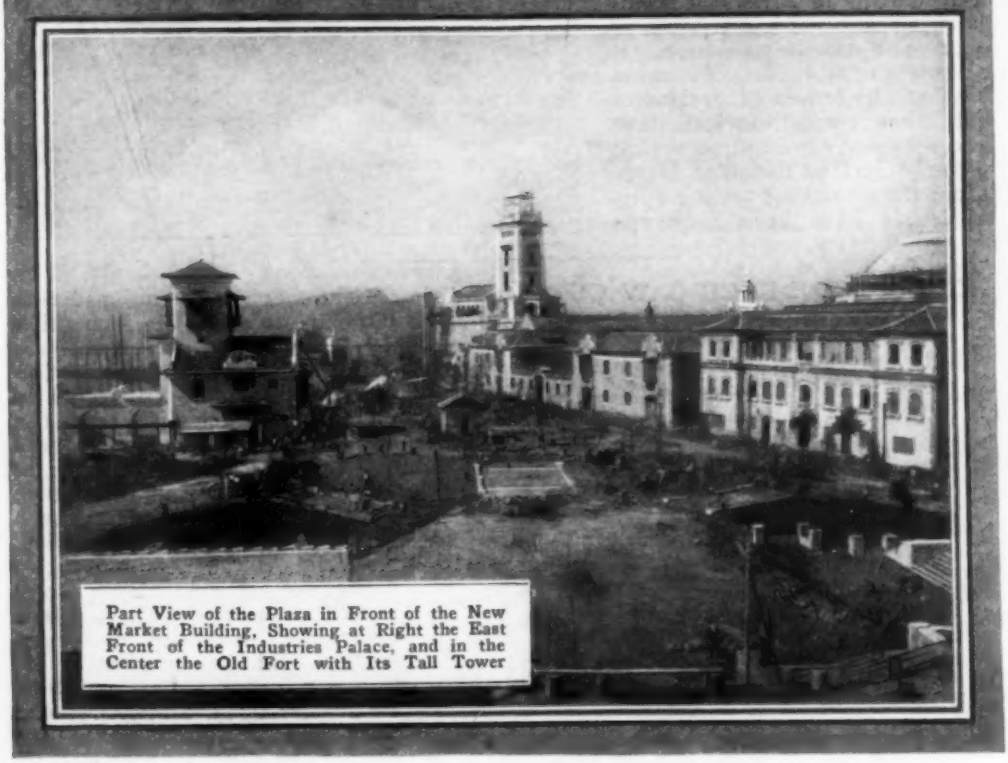
Gateway to the Exposition: The Brazilian States Building Is at the End of the Street, the Administration Building to the Right, and Small-Industries Pavilion to the Left

PHOTOS BY

FOR BRAZILIAN CENTENNIAL CELEBRATION

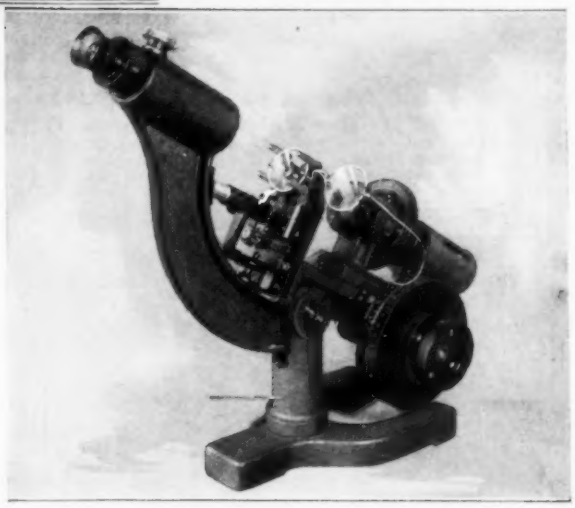


View of the New Market Building at the Northern Boundary of the Exposition Grounds, Looking North: In the Foreground Are the Fish and Game Pavilion with Statistics Pavilion behind It



Part View of the Plaza in Front of the New Market Building, Showing at Right the East Front of the Industries Palace, and in the Center the Old Fort with Its Tall Tower

A. B. MIRZAOFF



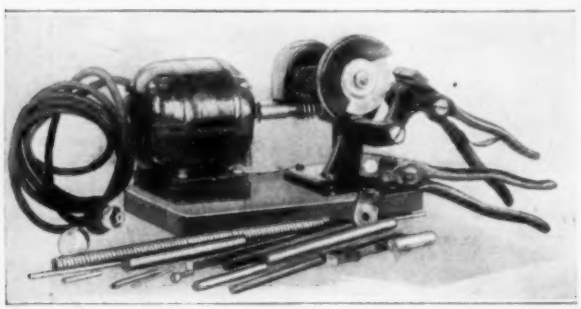
Above: The Inventor of the New Method of Testing the Accuracy of Optical Lenses is Here Seen with the Instrument He has Perfected. Right: Another View of the Instrument, Showing the Means of Holding a Pair of Spectacles

INSTRUMENT MEASURES LENSES BY LIGHT WAVES

By means of a new instrument perfected by an American scientist after a number of years of labor and experimentation, it is now possible to determine whether the lenses of eyeglasses and other optical devices have been accurately ground according to the prescribed formula. Heretofore the means for testing optical lenses have been only approximately accurate and more or less liable to human error. This instrument uses the light passing through the lens to measure its power, as a resultant of the combination of surfaces to which it is ground, and takes into account the refractive index of the glass of which it is made. As it combines the advantages of the other methods, none of which is complete in itself, and eliminates the defects peculiar to each, it is seen as the means of standardizing the testing of lenses for eyeglasses, the benefits of which will accrue to the millions of persons who are dependent almost entirely upon these aids to vision.

HIGH-SPEED BENCH SAW CUTS HARD OR SOFT METALS

Easily portable, a bench saw has been designed specially to save metal, saws, and time. The machine is equipped with a small circular saw, only 1/32 inch thick, covered by a guard and driven through worm gearing by a 1/8-horsepower inclosed motor that can be connected to any lamp socket. The saw can be driven at a very high speed for cutting soft metals, such as brass or copper, and at a much lower speed for hard metals, such as cold-rolled steel or drill rod. Attached to the saw support is a plierlike adjustable work holder that grips the metal while it is being cut. The saw cuts very rapidly, and, on account of its thinness, makes a clean cut with small waste of material. The saws can be interchanged for cutting the different metals.



Portable Bench Saw, Weighing 40 Pounds, for Hard or Soft Material, That can be Run from Any Lamp Socket

COMMENT AND REVIEW

[These pages were printed September 26, 1922.]

A Place in the Sun

IN these days nations have become so large, and so attached to their home land, they no longer emigrate in a body, as history tells us was done by the Israelites, Aztecs, and others. Even the tremendous influx which this country experienced during the past 100 years, coming from almost every nation of the world, had begun to subside before legislation put limitations in force. The flow of emigration toward Australia, Africa, and South America, which are the remaining great unsettled continents, is relatively slow, and at a rate in no way comparable to the thousands which poured into the Dakotas, and west thereof, during the 80's.

Writing in the Yale Review, Henry Pratt Fairchild makes the statement that the world's population in the 114 years ended 1914 more than doubled, going from 700 million to 1,649 million; while in the five years from 1906 to 1911 it increased at the rate of doubling every 60 years.

The startling result of such increase for 10,000 years is inconceivable. Mr. Fairchild says that after filling the standing room of the earth's surface by allowing each person one and one-half square feet to stand on (a little crowded for overweights) there would still be 60,750,000,000,000,000,000,000,000,000,000,000 individuals left over, with not even "standing room only," or to confine the figures to the United States, the rate of increase from 1906 to 1911 would give us, at the end of this century (1999), a population about one-third larger, on a territory one-fourth smaller than China today. And we think of China in terms of "teeming" humanity!

Against this appalling future Mr. Fairchild offers consolation in the words, "There is no more pernicious proverb than that history repeats itself. That is the one thing that history never does." (Disraeli also frequently said the same.)

Another surprising statement he makes is, that emigration does not reduce population, and that land aggression, hostile or peaceful, fails to solve the problems of overpopulation. "We could draw off a million Chinese a year," he says, "for 50 years, and at the end of the period China would have just as large a population as if not a soul had emigrated." The prospect is that in future the efforts and inducements held out to attract emigrants to the United States, Canada, Brazil, Argentina, and Australia will be lessened, and legislative restriction may be expected. Mass movements of population from one country to another will not long be permitted.

Encourage American Dyes

WHEN the war broke out our supply of coal-tar dyes, medicinals, and chemicals in great variety was suddenly reduced, and later, of course, was entirely cut off. We had depended on Germany so long and to so large an extent, that for a time our manufacturers were greatly crippled. The home production of these essentials had been so poorly supported and encouraged, we found ourselves in a surprising state of impotent dependence.

Our manufacturers of chemicals then set to work to produce these necessities here, but they were confronted at the very beginning with hundreds of American patents which the Germans had taken out for the sole purpose of blocking manufacture here. Later, when we entered the war, these owned-in-Germany patents were taken over by the alien-property custodian under act of Congress, and still later he was authorized to sell them at public auction, as no Government agency existed which had authority to acquire them. Therefore, a corporation was formed, which was as nearly as possible a quasi-public one, and this organization—The Chemical Foundation, Inc.—became the holding company for these patents.

The Chemical Foundation is controlled by five trustees, none of whom owns any of its stock or is himself a manufacturer. While limited dividends are permitted under its charter, it has paid no dividends; its president receives neither salary nor expenses, and all moneys received above expenses and dividends must be devoted to the advancement of chemical science and education in this country. It has authority to license manufacturers under the patents it acquired, but cannot give an exclusive license. Any American citizen could procure the same license, on precisely similar terms, with assurance of security and encouragement from the

Government. American manufacturers took licenses under these patents and invested more than $100,000,000 in new plants.

Considering the short time in which they have been experimenting and operating, the results are highly encouraging. Many dyes and chemicals are already produced here which are equal to what formerly came from Germany; others are admittedly inferior, but it must be considered that Americans have only begun, and have made really wonderful progress in their three years, as contrasted to the more than half a century of similar manufacture in Germany.

Naturally, in their attempt to regain their former world-wide markets in all other lines, the Germans resent our entrance into an industry which they led and practically controlled, and hence they seek to recover their lost patents here. In furtherance of this effort, a bill is before Congress to restore to them the American patents they formerly controlled. To do so would be a repudiation of its recent promises by the Government; would throttle a most important and essential industry, and would cause an irreparable loss to the country at large, and personally to those who have put their millions into the new chemical enterprises here.

Great Britain, France, Italy, and Japan have already passed laws creating a complete embargo against the importation of such dyestuffs as are made in their respective countries; and Great Britain has gone farther, and is subsidizing the industry to enable its manufacturers to compete with Germany in the markets of the world. What is known as a "selective embargo" on dyestuffs is now before Congress. It would seem we too should promptly institute such a protective embargo here, and not restore the patents taken over by the Chemical Foundation.

THE Government has its coast guards, and sentinels to prevent and fight forest fires; and some states already have a mounted state constabulary. It is rapidly becoming evident that, at least all the more densely populated states, will have to have their state police.

State Mounted Police

Time was when a traveler was as safe from attack on a country highway as in a courthouse, but this is so no longer. The more miles of good roads a state provides, the more automobiles it has, and the easier it becomes for bandits to make their holdup in store, house, or highway, and escape in a stolen car. Where the theft occurs in a town or city, its police cannot go very far afield in pursuit of the robbers, and the small towns and country communities have only a limited force.

A state mounted force, a good proportion on motorcycles, properly distributed, could be put in action very quickly as a dragnet, making escape much more difficult than under present conditions. As the chances of escape became more difficult and unlikely, crime would automatically largely decrease.

"SAWING a Woman in Half" is the well-known title of an illusion which has created a furore wherever presented. It was conceived by Horace Goldin, who is receiving larger royalties from other magicians who are presenting the mystery, than has ever been paid in the history of magic. The apparatus used in the act was also invented by Mr. Goldin and built in that famous workshop of secrets maintained by Thurston in Long Island. Like all other great successes, there sprang up rivals, which were stopped by injunctions in Illinois, Pennsylvania, and Ohio.

Magicians' Rights Recognized

Then a moving-picture producer, more enterprising than just, succeeded in getting possession of the secret of the mystery. A film was made showing the regulation stage performance, and following this was a complete exposé, fully illustrated, showing exactly how the mystery was accomplished.

Mr. Goldin sought to obtain an injunction against the manufacturer and the showing of the film, but was refused in a lower court. On appeal to the Supreme Court of New York State, the judges, five in number, unanimously decided in Mr. Goldin's favor and reversed the ruling of the lower court.

It is unnecessary to recite in detail the evidence and arguments on both sides. The evidence proved conclusively that Mr. Goldin was the originator of the

mystery, but the interesting feature is that the court recognized the mystery as a tangible property that can no more be appropriated or stolen than a horse.

The decision, coming from so high a tribunal, establishes a precedent of untold importance to magicians, who will now feel warranted in spending money—as Mr. Goldin did several thousands—in inventing and constructing the apparatus necessary to produce what is known as a major mystery, and rely on legal protection of their rights. The outcome will doubtless be of the greatest encouragement to the profession to produce new and wonderful features of entertainment which the amusement-loving public will appreciate and enjoy.

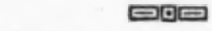
The Society of American Magicians and Harry Houdini, its president, are to be congratulated on this legal victory which means so much to all of them.

Gliders a Fad

TWENTY years ago when gliders were being flown by such scientists as Lilienthal, Canute, Picher, and the Wrights, they were the subject of jest and scorn in the daily press. Only a few years later they were being made and flown by boys as a new and startling amusement. This experimental work, however, established the foundation for what became, with the aid of the gas engine, the present airplane. Of late, considerable interest in the glider has been revived by remarkable achievements, especially in Germany. Some have even dared to predict the powerless plane as a practical vehicle of the air.

While it is true some wonderful flights have been recorded during the past year, the glider promises to be very limited in its operations, and of little dependable use except as a landing plane from passenger express planes; to improve the airplane by further discoveries of the gliding ability of birds, and as an amusement. Some people are misled by the endurance of certain birds to remain aloft apparently motionless for a long time, into the belief that gliders can duplicate bird flight; but did anyone ever see a bird rise from the ground or water by merely spreading its wings and facing the wind? Or an eagle step off from some lofty tree or mountain crag and only spread its wings? The bird takes its start with wing propulsion, and largely, if not entirely, makes its ascent by the exercise of wing power, even though the wing motion is too slight to be detected by an observer on the ground, hundreds or thousands of feet below. The glider is a vassal of the wind and can no more go in any direction desired, at any moment, than a stuffed bird.

Its use therefore can only be quite limited, and certainly very much less than many have been given to expect and hope.



Abolish the Revolver

EVER since the invention of the pistol 400 years ago, its sole purpose and that of its successor, the revolver, was to kill human beings. Outside of legally authorized war, they have undoubtedly caused the accidental or murderous death of a thousand for every life saved by their justifiable use. The possession of such arms should be limited to military and police forces. For the hunter, the farmer, the explorer, and for target practice, the larger firearm affords quite sufficient service and protection. The concealed weapon is very seldom of value to any but the lawbreaker. The chief of one of the largest city police forces in this country says that more than 90 per cent of the sales of revolvers at the present time are to the criminal classes.

The revolver is really the weapon of the coward; without it the thug and holdup man would immediately lose his nerve in most cases, and would soon abandon his profession. Holdups in offices are of daily occurrence because one or two dash in and cover the occupants with "guns," but if these same bandits tried to accomplish their purpose with rifles, crowbars, or clubs, the results would be vastly different.

Some cities have tried to limit and control the sale of small firearms, but the effort is practically a failure because evasion is so easy, and then there is always the mail-order dealer sending goods in plain packages to fictitious names. If the bandit is afraid to purchase from regular dealers or pawnbrokers in town, he has the shipment mailed to some small suburb, a few miles out, where both he and the nature of the goods he receives are unknown and excite no comment.

A Chicago business man, John R. Thompson, a year ago advertised a reward of $1,000 to anyone who would send him one really good reason (outside of military or police) why the manufacture of revolvers in this country should be allowed to exist. He has yet to receive a single convincing reason.

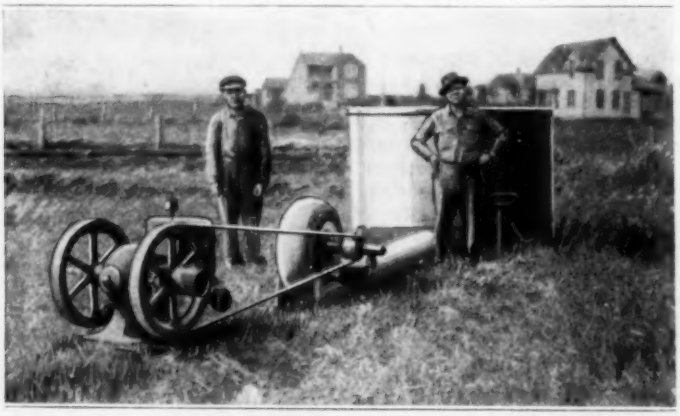
The alarming increase in crime and murder made possible by the possession of revolvers, has become such a national menace that nothing short of a Federal law prohibiting their importation, manufacture, sale, or possession (outside of museums, and military or police) can abate the evil. All possessors of revolvers should be required to turn them over to Government officials, and a heavy fine, or fine and imprisonment to fit the case, should then become effective. Criminals, fearing the strong arm of Government and finding it less easy to evade penalties, would be less inclined to carry arms, and as fast as arrested would lose what they had. We have too many laws now, but this is one more that would produce widespread and immediate good results, without depriving anyone of a necessary personal right.

Many publishers, recognizing the assistance which their columns were giving the criminal class by advertising revolvers to be sent by mail, are now voluntarily refusing to accept such advertising, although in many cases perfectly reputable firms were included in the ban. This magazine adopted such a policy months ago. Our Government should itself manufacture what few concealable firearms it permits to be used, and prevent all others from doing so, and from importing.

H. H. WINDSOR

STUMPS ARE QUICKLY BURNED WITH AIR-BLAST OUTFIT

Stumps can be quickly burned with the use of an incinerating outfit consisting of a blower driven by a gasoline engine, and a sheet-iron jacket which is placed over the stump to be destroyed. After the apparatus is in position, a fire is started at the base of the stump, and is steadily fanned with the engine-driven air blast until the wood is entirely reduced to ashes. The apparatus is safe, simple, labor-saving, inexpensive to operate, and does a neat job, and if desired, a blower with sufficient capacity to supply several jackets with blasts may be utilized, thus making it possible to burn a number of stumps at one time.

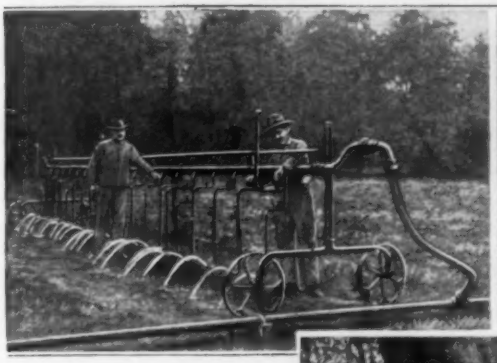


Air-Blast Outfit Which has been Successfully Used to Incinerate Stumps, Showing, from Left to Right, the Gasoline Engine Belted to the Blower Fan, and the Large Cylindrical Sheet-Iron Jacket

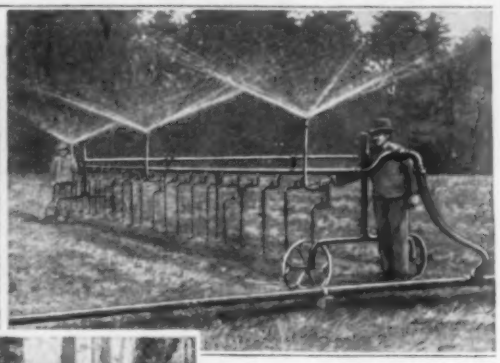
RECREATION AND CAMP SITES GIVEN STATE OF MICHIGAN

Eleven park sites, ten of which have lake or river frontage, have been presented to the state of Michigan to help offset the congestion at the few remaining open parks and bathing beaches, resulting, it seems, from increased automobile travel. The new parks are all in the lake district around Detroit and consist of 627 acres of natural wood and lake country. Only one is without water, and that is a rugged stretch noted for its beautiful scenery. The purpose of the donation, as stated by the Dodge Brothers, is to provide a memorial to the late John F. and Horace E. Dodge, for whom the parks are to be named, and to give motorists places where they may have their picnics, games, and bathing without encroaching on private property.

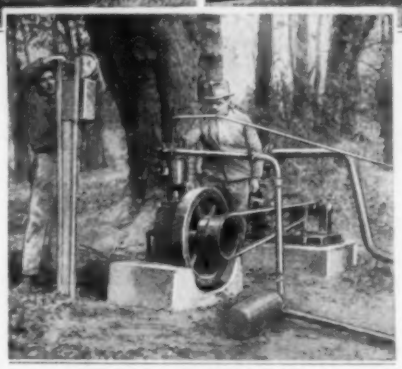
PORTABLE SPRINKLERS WITH POWER-DRIVEN PUMPS



Large Portable Field Sprinkler with Its Suspended Discharge Nozzles in Use Throwing Streams of Water in Parallel Lines

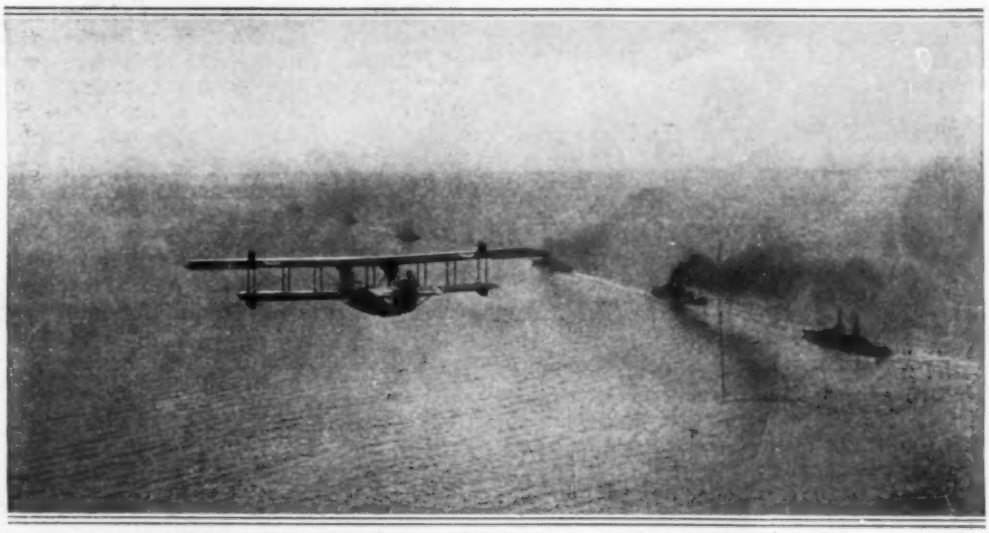


Portable Sprinkler with the Upright Spraying Nozzles in Use, Showing How They Cover a Wide Area of Ground Evenly



Gasoline-Engine-Driven Pump Which Furnishes Water under Pressure by a Hose Connection to the Sprinkler

Large portable field sprinklers operated by gasoline engines and pumps, are in use in Germany, especially where intensive cultivation is applied. Each sprinkler, mounted on a pair of wheels at each end, consists of a long horizontal system of piping in connection with three vertical spraying nozzles above it, and with about 20 smaller suspended pipes with discharge nozzles just above the ground level. The spraying nozzles cover evenly a wide area, and the hanging nozzles drop streams of water in parallel lines. The sprinkler can be operated at some distance from the source of water supply, where the pump is located, and which has a hose connection to the sprinkler.



SEAPLANES ARE NOW ESSENTIAL IN NAVAL MANEUVERS

DURING recent maneuvers of the U. S. Navy, large seaplanes have accompanied the fleets and kept in constant touch, by radio, with the battleships. This type of plane is now an indispensable factor in naval operations, acting as a scout, and also directing the maneuvers.

SMOKESTACK THAT SPECIALLY ATTRACTS LIGHTNING

Attempts are being made to ascertain what causes the attraction of lightning to a smokestack 150 feet high that is located at the intersection of Elston and Webster avenues, Chicago. In the immediate vicinity there are some 22 other smokestacks of about the same height, and not one of them has been struck this year, whereas this particular one has been struck three times. The first time 50 feet of the top of the stack was demolished; the second time about the same length was split, and the third time the lightning spiraled down the full length of the stack and reached the fire box of the furnace.

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BATTERED, BENT, AND BROKEN CAR MAKES RECORD

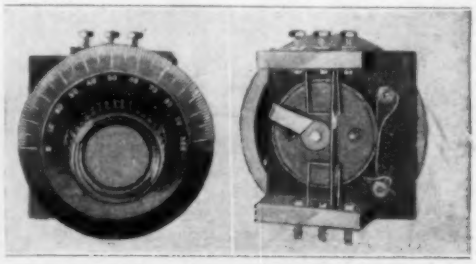
Battered, bent, and broken, an American small car of a well-known make recently established an unparalleled record for consistent performance under the most adverse circumstances. This car, the property of the American relief, was driven across the great sand steppes of southern Russia and was the first machine to accomplish the passage of these wastes. However, even this car paid a severe penalty for the feat. After the long and dangerous trip, the tiny "Car of Juggernaut" came literally "limping" back with the appearance and sound, according to eyewitnesses, of a large tin can on wheels. Somewhere on the history-making tour, a front spring had been broken, the main bearings had disappeared, the clutch band had parted, the grease had left the crankcase, and the tires were punctured. The versatile driver had used string, rope, wire, and sundry other materials to bind and bandage the damaged parts, had made main bearings from an old lead pipe, filled the crankcase with lard and the tires with sand, but the unconquerable "flivver" came triumphantly "home" under the power of its own grinding and "knocking" engine.

SLIDE-RULE DEVICE SOLVES TRIGONOMETRIC FORMULAS

A new instrument combines the ordinary slide rule in semicircular form, with a supplementary half from which can be read the values and solutions of trigonometric functions and formulas, and which also serves as a protractor. It is made of celluloid of substantial thickness with a transparent runner arm, and its pocket-fitting shape makes it convenient for field or office use.

RHEOSTAT AND JACK SWITCH COMBINED FOR RADIO

A new combined rheostat and jack switch for radio sets serves a double purpose and eliminates the use of a filament-control jack. The rheostat, which is operated by turning a dial on the panel, consists of two small resistance coils, connected by a tiny wiperlike brush. At the extreme rear end of the dial shaft is a cam which causes the jack switch automatically to make contact whenever the dial is turned to bring the resistance coils into the circuit. By the combining of these two parts in one piece, the radio enthusiast can use a smaller cabinet and panel for his outfit, and consequently less wiring with less possibility of loose connections, so that a saving in space and cost, as well as added efficiency, are obtained.

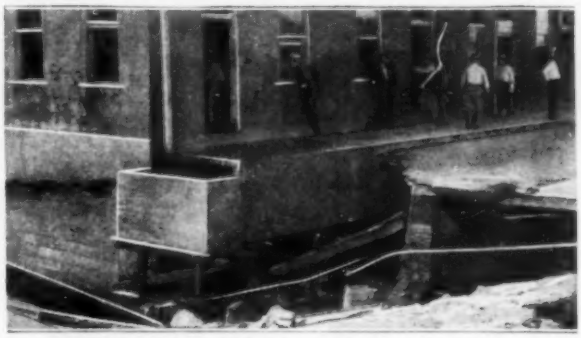


Left: Combined Rheostat and Jack Switch as It Appears from the Front of the Panel. Right: Rear of Appliance, Showing Contacts

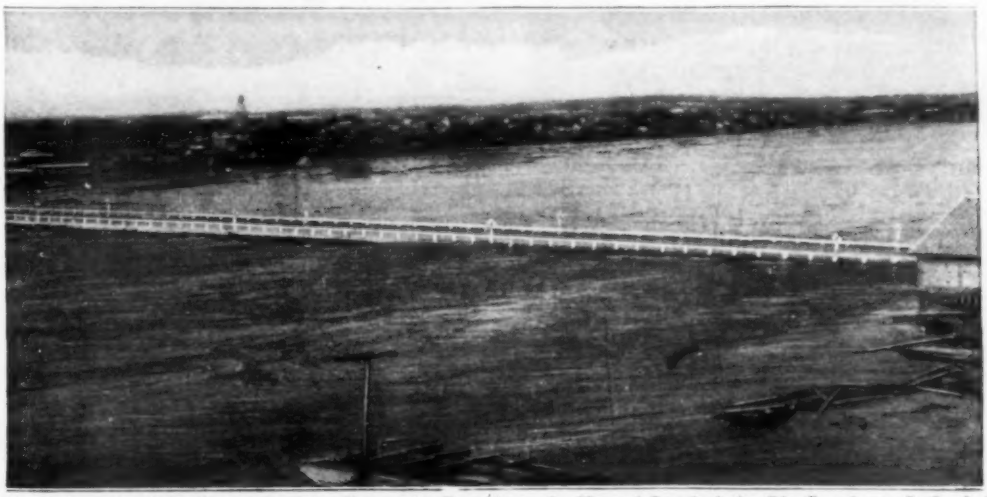
Scene at New Laredo on the Mexican Side of the Rio Grande, during the Flood This Summer, When the River Covered the Streets near the International Bridge under Two Feet of Water

TEXAS PLANS FLOOD CONTROL ON THE RIO GRANDE

THE Rio Grande, which forms the international boundary between Texas and Mexico, impresses the average traveler as a passive stream content to follow its sinuous course among the sand bars to the Gulf of Mexico. During the dry season there are spots in its bed with barely enough water to refresh a team of horses, and yet Texans living along its banks in the summer of 1922 saw it rise in a few hours to a swollen torrent.



Flood Damage Done to Offices of Custom, Immigration, and Health Departments Located at American End of International Bridge across the Rio Grande



The International Bridge at Laredo, Texas, 40 Feet above the Normal Level of the Rio Grande, as It Looked at One Stage of the Recent Flood

Because of these experiences, the state of Texas is now planning to avert future floods, with their attendant loss of life and property, and remove the menace to important railroad centers. The new international bridge, at Laredo, had hardly been completed when the river suddenly rose in the recent flood to a height of 51 feet above its normal level, submerging the bridge under several feet of water and entirely destroying the Laredo approach. For the first time, one block of streets beyond the bridge on the American side and several blocks on the Mexican side were covered with water, and the Immigration, Public Health, and Custom departments at the end of the bridge inundated. This flood was the worst since the one of 1919, when a high-water mark of 34 feet was recorded.

PERAMBULATING INCINERATORS IN CALIFORNIA VINEYARDS

Far from ruining the grape industry, as was at first feared by those interested, prohibition has actually boosted the business. One way in which the increased prosperity has expressed itself is the advanced method now used in the vineyards for the production of the best possible crop, both in quality and quantity.

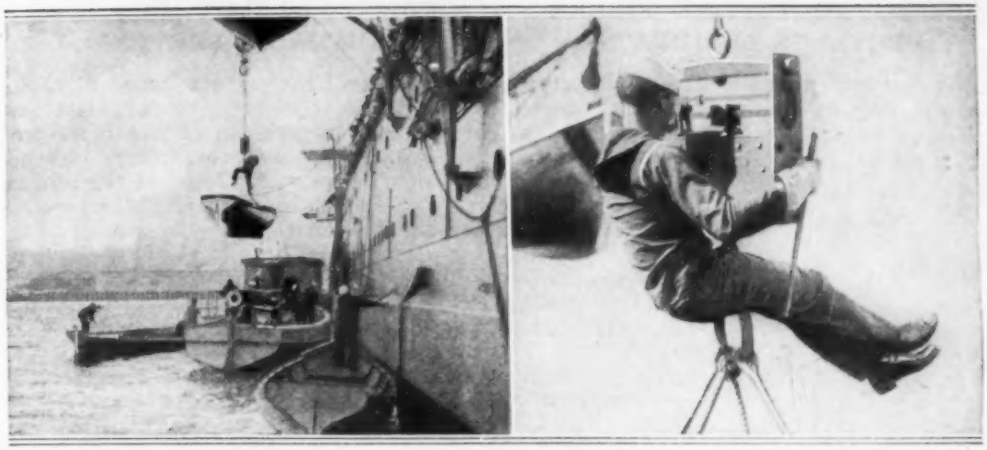
This Incinerator is Towed about Vineyards for Burning Grape Stalks and Weeds, So That the Ashes are Not Deposited in the Soil to the Detriment of the Following Year's Crop

After the grape crop is harvested the vines are cut off close to the ground, to grow up again the following year. Formerly the stalks were burned on the fields, but now it has been learned that the burning of grape stalks on the ground is injurious to next year's crop. To get rid of the old grape stalks, the growers now use wheeled incinerators in which the stalks are burned as the odd vehicle is drawn through the vineyards by teams of mules. The draft gear is lengthened, to keep the animals away from the heat of the fire in the incinerators, and the ashes are hauled away in the same vehicle.

FOREST-SERVICE MEN HONORED BY MEMORIAL

Commemorating the brave men who lost their lives fighting forest fires in Idaho and Montana in 1910, the United States Forest Service recently caused a monument to be erected in the first-named state. The memorial is located in the heart of the St. Joe National Forest, and consists of natural stones cemented together and forming a rectangular inclosure, with a column rising at one side. On the column is a tablet bearing the names of four men and designating another simply as "unidentified." Beneath the names is the inscription: "Died Fighting Forest Fires. August 20, 1910."

Monument of Natural Stones, Erected as a Memorial in Honor of Forest-Service Men Who Lost Their Lives While Fighting Forest Fires in Idaho and Montana in 1910



Left: Weighing In the Boat Representing the Battleship "California," Winner of the Recent Pacific-Fleet Boat Race, to Ascertain That It Had the Required Poundage of 1,650. Right: Close-Up of the Scale Used in Weighing the Boats, and the Sailor Who Acted as Official Weighmaster for the Event

PACIFIC-FLEET BOAT RACE CLOSELY RUN

One of the most interesting events in the annals of Pacific-coast sportdom — the championship boat race of the Pacific fleet — was held on Lake Washington, Seattle, the last week in August, and was participated in by carefully trained boat crews from 11 warships, including the 1921 champions from the dreadnaught "Mississippi." The race was run over the usual two-mile course and was won by the "California's" crew. More than 50,000 persons witnessed the contest.

Every boat entered in the race had to comply with U. S. Navy standards. Testing the entrants was a matter of precision, and each boat had to meet a weight as well as displacement test. Each boat had to weigh 1,650 pounds; if too light, ballast was added to make up the weight. The crews, although constantly in the pink of condition, due to the nature of their vocation, spent several weeks in intensive training in preparation for the race. The thoroughness of this training may be judged from the fact that at the end of the two-mile race, four boats, entered by the "New Mexico," "Tennessee," "Mississippi," and "California," were grouped less than 9 feet apart, the close finish arousing great excitement among the spectators.

¶A 15-acre orange grove within the city limits of Anaheim, Calif., has been purchased at a cost of $45,000 by the Chamber of Commerce as a site for the annual Valencia Orange Show, held in May, each year.

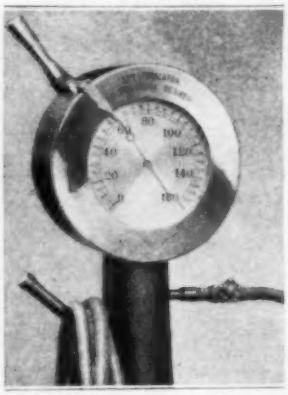
BODY OF MOTOR CAR BUILT TO IMITATE CHURCH

Constructing an imitation church on the chassis of a small motor car of well-known make, was the method adopted by a New York minister literally to take his sermons to the people. The odd-appearing vehicle, in which he intends to tour the country, has windows in front, doors at the sides, a steeple on top, and a pulpit at the rear, from which he preaches to the various gatherings.

Imitation Church and Its Pastor, Shown Ready for the Beginning of the Country-Wide Tour of Preaching

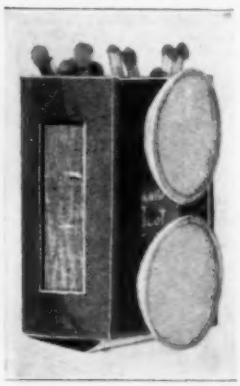
"FOOL-PROOF" TIRE FILLER PREVENTS ACCIDENTS

"Fool-proof" methods have superseded the old way of filling automobile tires, which was a precarious task when the air-supply pressure was not known. The new way includes the installation, on the air line, of a gauge containing a movable indicator, in addition to the usual "hand." This indicator is first set at the point on the gauge which the motorist desires his tire pressure to be. When this pressure is reached, the gauge shuts off the supply.



NEAT MATCH HOLDER FASTENS TO WINDSHIELD BY VACUUM

For the convenience of motorists a match holder has been devised which, by means of two rubber vacuum cups, can be fastened to the windshield, side-door window, dash, or any other part of the car that is flat and smooth. It is only necessary to moisten the edges of the cups and push them tightly against the surface, to which they adhere tightly.



APPLES ARE MONOGRAMMED IN WESTERN ORCHARD

Monograms were stenciled, this fall, on the entire crop of an apple orchard in the western part of the state of Washington. The name or the coat of arms of the consignees, for the most part large hotels, was put on in blue ink while the apples were still green. After they had ripened, the ink was washed off, leaving the design in pale greenish-yellow.

QUARTER-IN-SLOT MACHINES FOR RADIO SERVICE

Evidence of the popular trend of radio is the announcement of a manufacturer of wireless apparatus, of contracts for 25,000 receiving sets to operate on the deposit of a quarter. Most of the outfits are for hotels and hospitals, where a guest or patient can drop in a coin, as in a chewing-gum or peanut-vending machine, and hear concerts, market reports, weather forecasts, baseball scores, and news of the day for the next 12 hours.

SPARK PLUG SELF-CLEANING BY CAUSING AIR SUCTION

A new self-cleaning spark plug, similar to any standard plug with the addition of an automatic air-intake valve, is said to have proved very satisfactory. The small intake valve connected to its iron shell admits air, during the suction stroke of the piston, around the central electrode and its insulation, thus both cleaning and cooling them. It has the further advantage of admitting air instantly at the beginning of the suction stroke of the piston, thus preventing excessive low pressure, which has a tendency to suck oil into the combustion chamber.

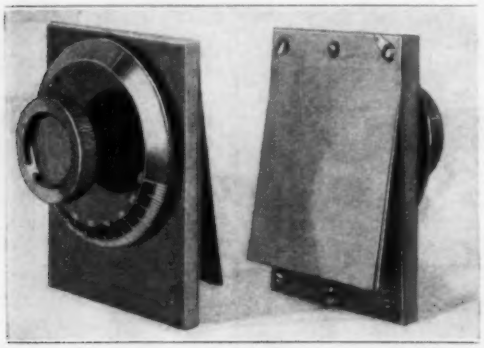
REINFORCEMENT FOR BRIDGE ASSEMBLED ON BARGES

Engineers in charge of the construction of the new Belle Isle bridge, at Detroit, had the reinforcing steel for the concrete arches assembled on barges. Two steel barges were sunk under the timber framework upon which the reinforcement had been built up, and when pumped out, caused the whole section, with part of the framing, to lift clear of the temporary supports. The barges with their load were then towed into position at the bridge, and the section of reinforcing steel was lowered into place on the piers by letting water into the hold of the barges.

Above: Section of Steel Reinforcement, Weighing 97 Tons, for Concrete Bridge, at Belle Isle, Detroit, being Placed on Bridge Piers. Below: Section of Reinforcing Steel, Assembled on Barges, Ready to be Towed to the Bridge

RADIO VARIABLE CONDENSER OF COMPACT DESIGN

A new variable condenser for radio equipment possesses many good features, chief of which are compactness of design and cheapness in price. The appliance is constructed with a movable, but not rotary, plate, which is adjusted by the usual dial on the shaft through the panel. With this condenser, close tuning is made easier than with the rotary type, as three turns of the dial are necessary to vary the apparatus from its minimum to maximum capacity. In addition, the rigid construction causes the condenser to remain in adjustment regardless of any accidental knocks or jars.

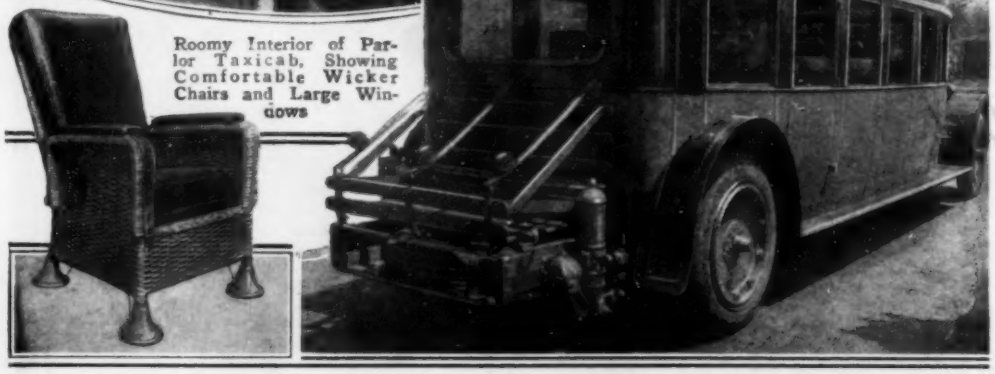


Front and Rear Views of Radio Variable Condenser, Showing Movable Plate Raised by Action of Dial Shaft Extending through the Panel

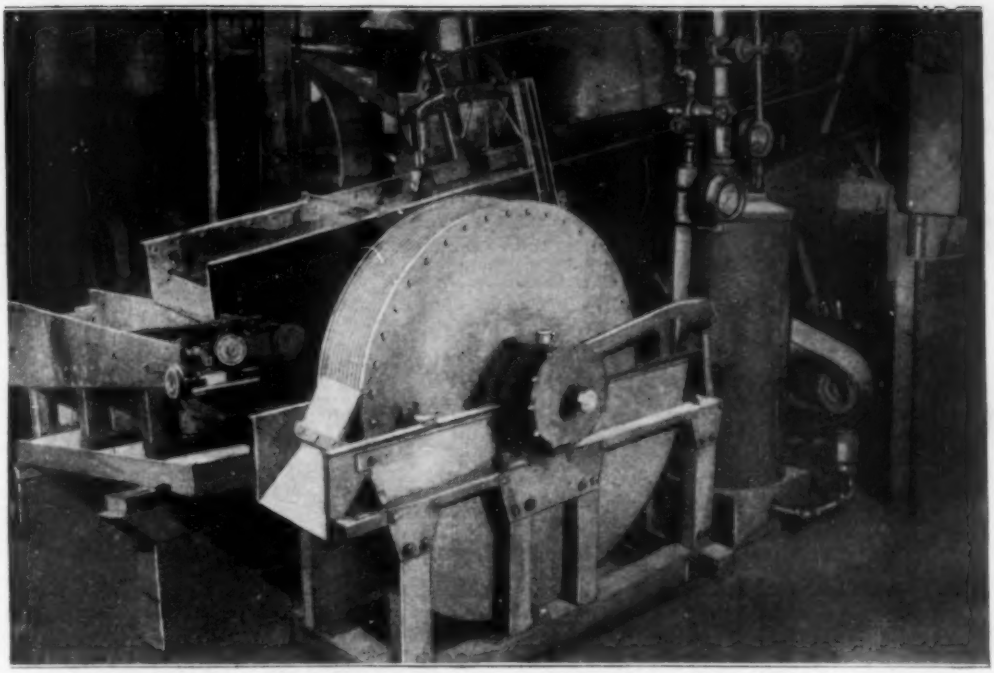
DE-LUXE TAXICAB FITTED UP LIKE A PARLOR CAR

A sensation in motor cabs is one that has appeared fitted up like a parlor car, and with the beautiful finish and luxurious appointments of an expensive private limousine. The unusually large body has wide plate-glass windows which extend to the top, and may be lowered into the sides in warm weather, affording a wide range of vision. Extra-wide doors extend to the running board which is only 16 inches above the ground, to permit easy entrance and exit. The rear seat is an overstuffed lounge, while the others are large wicker chairs held to the floor by rubber vacuum cups, which the passenger can release when desiring to move the chair. The driver's compartment provides space for hand luggage. Cut-glass dome lights and flower holders, a vacuum water carafe, ash receivers, mirrors, and a folding table are among the other attractive features of this unusual commercial car.

Roomy Interior of Parlor Taxicab, Showing Comfortable Wicker Chairs and Large Windows



Left: Note Rubber Vacuum Cups Which Hold Chair Legs to the Floor. Right: Rear View, Showing Substantial Tire and Luggage Rack, and Large Air-Cushioned Shock Absorbers

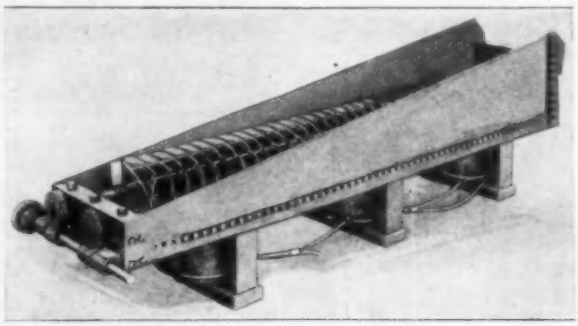


Equipment for Fine Grinding and Magnetic Concentration of Iron Ore: The Drum Filter is Shown in the Foreground; in the Center Is the Long Trough, or Classifier, at the End of Which is Shown the Magnetic Log Washer, While at the Top, in the Rear, can be Seen Part of the Pulverizing Ball Mill

TAPPING NEW IRON RESOURCES

By EARL CHRISTMAS

UP AT Babbitt, Minn., an experiment of great importance is being worked out these days. If it succeeds, the life of the iron-mining industry in the Lake Superior district, instead of being limited to a score of years, may be doubled or tripled. Billions of tons of low-grade ore, hitherto regarded worthless, may be converted into iron. Under present mining methods, an ore cannot be mined profitably in this territory unless it contains about 50 per cent iron, and ores with a smaller iron content must be concentrated before shipment if they are to be utilized.



Magnetic Log Washer Which Makes Possible the Use of Billions of Tons of Hitherto Worthless Iron Ore, Showing How the Electromagnets are Placed beneath the Washer

Magnetic concentration of the ore through a new process developed at the mines-experiment station of the University of Minnesota may be the solution of this problem. The process is being put into operation on a large scale at Babbitt, at the eastern end of the famous Mesabi range, and represents the first big attempt of the kind to utilize the lower-grade ores.

Magnetic concentrators had been used before with materials of rather coarse nature, and with considerably richer ores. The mines-experiment station went farther and developed a device, known as the magnetic log washer, which separates the iron from the rock in pulverized form. This supplied a missing link, as it were, and apparently has made possible the utilization of great stores of ores considered unprofitable.

Worked out on a small scale at the university, the process was tested by mining experts in a mill built for the purpose in Duluth. As a result of the tests, a plant costing $3,000,000 is just being completed at Bab-

bitt, the first unit in a large mill planned there. If this first unit proves the process is a success under actual conditions in the field, then many more units will follow.

Nor is this the only reason mining men are watching Babbitt with so much interest these days. Minnesota has great stores of hematite that cannot be utilized under present mining methods. Now, hematite is very similar to magnetite in composition, except that hematite has a slightly larger percentage of oxygen. Hematite is not magnetic, however. But engineers have shown that hematite may be made magnetic by heating. Then, the ore may be treated by the process of magnetic concentration.

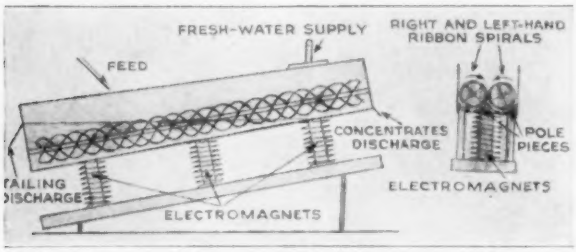
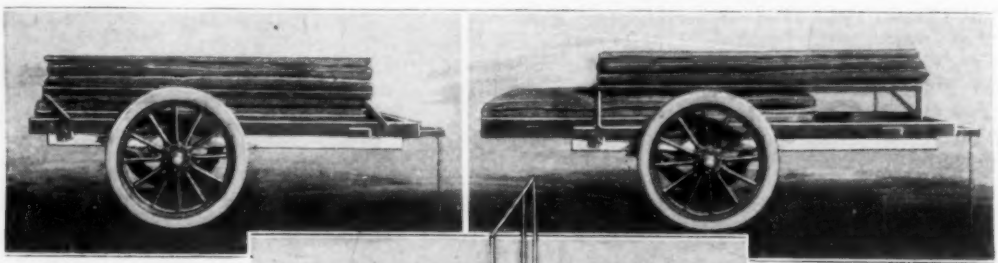


Diagram Illustrating the Principles upon Which the Magnetic Log Washer Operates, and Showing How the Magnetic Materials are Retained and the Nonmagnetic Washed Out

In the plant at Babbitt, large crushers will reduce the rock to pieces about 2 inches thick. It then passes through a device known as the "magnetic cobber," which excludes part of the nonmagnetic material. The magnetic cobber, operating with these coarser materials, has been in use for some time in other districts.

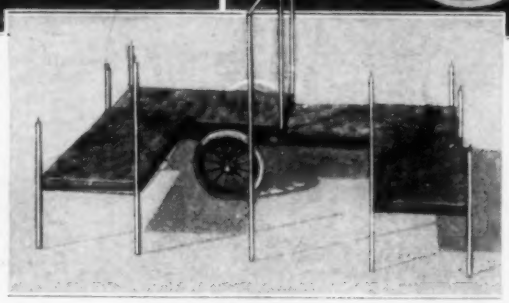
The process of crushing, cobbing, and discarding worthless materials continues until the ore is reduced to pieces about ¼ inch in size. Then it is pulverized in ball mills. The ore next goes to the magnetic washer, the final step in the process of separation. In this boxlike apparatus, magnets attract the magnetic materials to the bottom and hold them there, while water, running through the washer, carries away the waste rock at one end of the log washer. The concentrate, containing about 64 per cent iron, is delivered at the other end.

AUTO TRAILER FOR TOURISTS MAKES CAMPING EASY



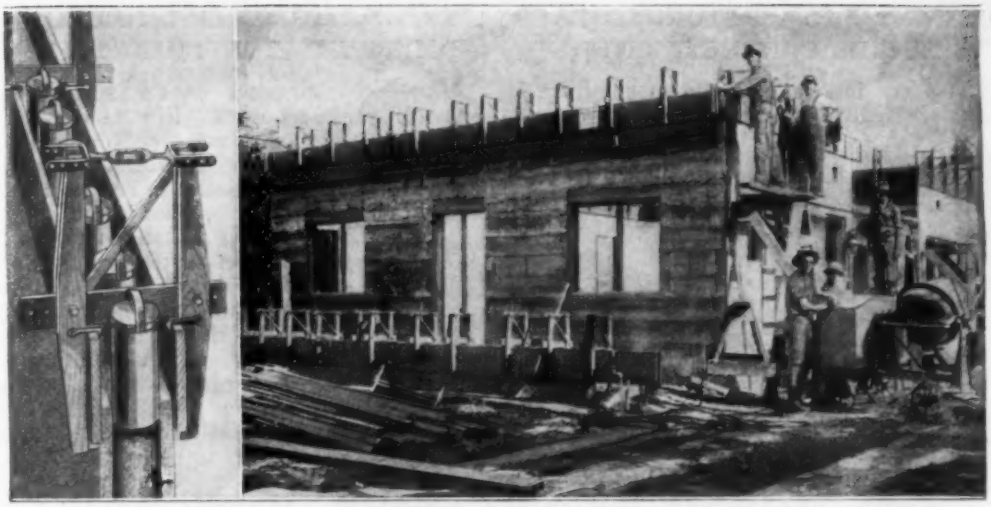
Two-Wheeled Automobile Trailer with Its Two Double and Two Single Beds Packed Ready for Traveling

In Preparing to Camp, the Two Bottom Beds are First Pulled Out, Allowing the Upper Beds to Drop Down



The Beds are Shown Ready for Use, with the Head of Each Single Bed Bolted to the Side of a Double Bed. The Ridgepoles between Them Support the Tent

Camping is made easy for the automobile tourist by the use of a trailer specially designed for that purpose. Mounted on two rubber-tired wheels, the frame of the trailer is 7 feet long by 3 feet 10 inches wide and carries, piled one above the other when traveling, two double and two single beds. When camping, these are pulled out and arranged side by side in such a manner, that, in connection with steel supporting poles, a canvas tent can be thrown over the whole. When traveling, this tent is carried on the trailer beneath the beds, and in front of them is a box for a camp stove and cooking utensils.



Forms for Pouring Hollow-Concrete Walls, Which are Built in Courses: At Top of the Finished Part of the Walls, the Forms are Seen Mounted and Ready for Pouring the Next Course; at Left Is an Enlarged View, Showing One Frame and Several Core Members

FORM FOR POURING CONCRETE HOLLOW WALLS IN COURSES

Simple and inexpensive in construction, a form for hollow-concrete walls that is very readily placed in and removed from its operative position has been recently patented. The form is composed of frame members, a series of which are mounted along a finished course of the wall so as to provide means for supporting sideboards extending upward and making a form for pouring the next course. Each frame member consists of a pair of uprights with transverse braces between them that are adjustable so that the sideboards can be supported in suitable position for any thickness of wall. Equally spaced between the sideboards are placed cylindrical core members to form a hollow-wall construction. They are supported in the cored holes of the finished course, and extend upward so as to continue these holes.

STORM KING MOUNTAIN ROAD READY FOR AUTO TRAFFIC

A splendid highway skirting the Storm King Mountain on the west bank of the Hudson River is now ready for auto traffic. The road, which necessitated six years of blasting through the rocky ledges of the mountain, shortens the route from Newburgh to New York by about 16 miles. The main section, which lies between West Point and Cornwall, is considered to be one of the most beautiful stretches along the Hudson.

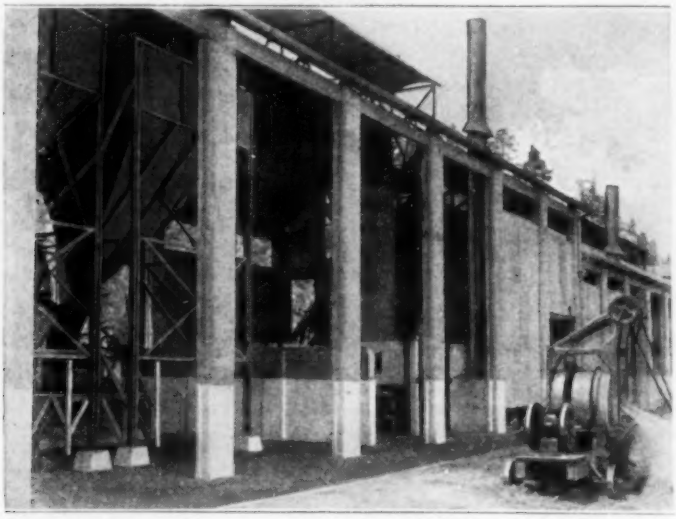
PHOTOGRAPHIC STATUETTES MADE VERY REALISTIC

Recently introduced into this country from Europe is a very interesting method of making photographic statuettes. The subject is photographed in the usual way. The paper print is then cut out, following the exact outline of the figure. This is pasted onto a mahogany board, 3/16 inch thick, which is cut away to match the photograph. When mounted on a small pedestal, this picture stands out in relief so that it looks like an actual statuette. At a distance it is hard to tell the difference.

¶Individual "traffic maps," distributed to the 1,500 pupils of the Southside High School in Fort Wayne, Ind., guided them through the building during the first days of the fall term.

CEMENT FROM RETURNED BAGS BUILDS CONCRETE SHED

The possibilities that lie in small savings are again demonstrated by a western cement manufacturer. At his plant a concrete building has been erected, using only cement recovered from returned empty bags. A special machine beat the cement out of the sacks, and enough cement was accumulated in this way, in a comparatively short time, to complete the structure. Large users of cement would do well to consider this, and save for themselves not only the cement reclaimed, but also the extra freight on this cement if returned with the bags.



This Building was Constructed of Reinforced Concrete, the Cement for Which was Entirely Obtained from Empty Sacks Returned to the Mill of a Western Cement-Manufacturing Company

SINGLE INSTRUMENT IS BOTH SPEED AND FLOW METER

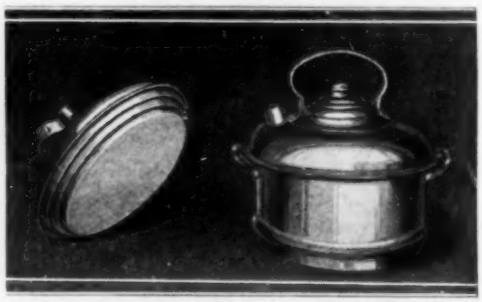
Fitted on the instrument board of an automobile, an ingenious instrument which shows the driver the fuel consumption in miles per gallon, is attracting much attention in England. The instrument has the appearance of an ordinary speedometer, but is a combination of this instrument with a flow meter. It shows the miles per hour in the same manner as a speedometer, while by means of a small moving hand on the dial, actuated by the flow meter, it also shows the miles per gallon. Thus the fuel consumption can be tested for all speeds and all adjustments of ignition and carburetor, and the most economical conditions can be ascertained.

PLAN NATIONAL ENGINEERING MUSEUM AT WASHINGTON

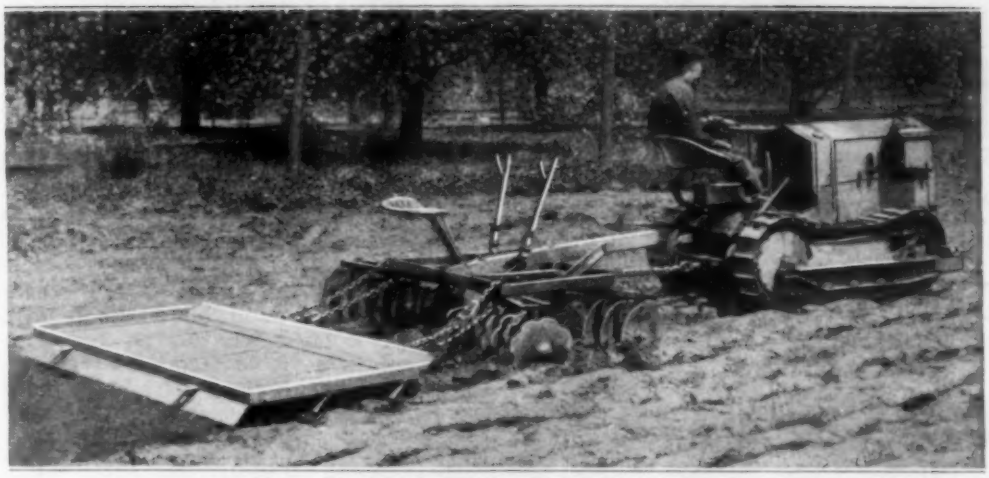
Under the auspices of the American Society of Mechanical Engineers, the coöperation of engineering societies, alumni associations, engineering schools, and others, is sought in support of a project for the establishment of an engineering museum in connection with the National Museum at Washington. The plan has the support of the Smithsonian Institution. With adequate coöperation, it is expected that there will be established at the national capital an engineering shrine worthy of the profession, and of great educational value. All societies or organizations interested can obtain further information by addressing Joint Committee on the National Engineering Museum, A. S. M. E., 29 West 39th St., New York City.

EXTRA WATER MAY BE HEATED IN UTENSIL COVER

Practical economy in the kitchen is aided by the production of a cooking utensil which includes a hollow cover having a water capacity of 3 quarts. With this appliance, the housewife may boil the meat, vegetables, etc., for the meal and at the same time heat enough water in the cover to make the tea or coffee, or even to use in washing the dishes.



At the Right is Seen the Economical Cooking Utensil, While at the Left Is the Removed Cover Which Holds Three Quarts of Water, That is Heated While Food is Boiled in the Pot



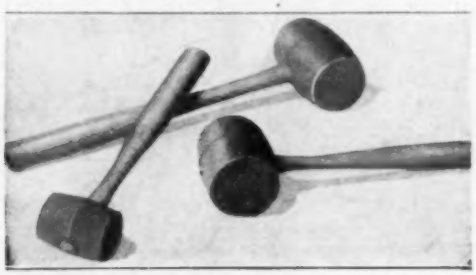
Clod Crusher and Leveler Chained to a Harrow Which is Hauled by the Small Tractor over a Plowed Field: It Crushes the Clods and Leaves the Soil Perfectly Level and Smooth. Three of the Bent Plates Are Sufficient for Most Kinds of Soil, But More can be Added

CLOD CRUSHER AND LEVELER OPERATES WITH A HARROW

Trailed by a disk harrow which is hauled by a small tractor, a combined clod crusher and leveler, recently constructed in Ohio, consists of a flat rectangular frame to which are attached three or more parallel metal plates partly bent down at an angle of about 45°. Following the harrow over a plowed field, these plates break up the clods, and level the soil much more smoothly than can be done by the harrow alone.

RUBBER MALLET FOR AUTO USE SAVES TIRE AND RIM

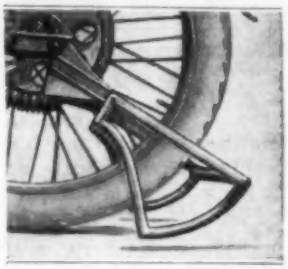
A large manufacturer of rubber goods is introducing a mallet with a rubber head, intended to eliminate the injuries to tires and rims that result from careless or misdirected blows from a metal hammer, when changing tires. The tool ought to save many bruised fingers, and will undoubtedly be appreciated by car owners and repairmen.



These Rubber-Headed Mallets, for Use in Changing Automobile Tires, do Not Injure Tires or Rims

IMPROVED MOTORCYCLE STAND SIMPLE AND EASY TO USE

With a new motorcycle stand the lower base is arc-shaped so that, instead of being lifted up and over the brace, the machine need only be pushed backward, whereupon it automatically raises itself and settles into position. The base of the improved stand is held by two arms that join together near the wheel hub.



ROOFING MATERIALS TESTED FOR HEAT RADIATION

Recent investigations of roofing materials in relation to their heat-radiating qualities, have been conducted by the U. S. Bureau of Standards. Nearly all material of this kind now available, either has both sides covered with asbestos, or both sides coated with aluminum paint. According to the experiments of the bureau, however, the best radiation results are obtained when only the outside of the roof is covered with asbestos or white paint, and the inside with aluminum paint. Thus it is claimed that tents and other similar inclosures, when exposed to the rays of the sun, can be made more comfortable in hot weather by preparing the roofs in that manner.

Thirty-Eight Years of Coöperation have Made Possible This Gathering of North Dakota Farmers at the Farm of One of the Members of the Group Who Are Successful Breeders of Dairy Cattle

COÖPERATIVE CATTLE BREEDING IN NORTH DAKOTA

By ALLEN P. CHILD

MANY years ago an Indian stood watching one of the pioneer settlers of North Dakota as he plowed a field. After the farmer had completed a few furrows, the Indian stopped him, and bending over, turned back a piece of the freshly plowed sod, remarking simply, "Wrong side up." In a certain sense the Indian was correct, for hundreds of North Dakota farmers have found that wealth comes to those who plow not, but who maintain large herds of dairy cattle.

A Family from a Herd of Plains-Bred Cows Accustomed to Taking Their Living by Grazing on the Native Grass of the Prairie, of Which Eight Acres are Required to Support One Cow

By retaining the prairie-grass pastures of the district around New Salem, 17 men, by their coöperative efforts, have established an enviable record in the raising of pure-bred dairy cattle. In 1906, one man bought a carload of such cattle for sale among his neighbors, and no individual took more than one head. In 1921, this same group owned 251 pure-bred cows. Together they bought 10 silos and let a contract to a local concrete contractor for the foundations. Later they invested in eight milking machines. For 20 years they have maintained a mutual fire-insurance company. Their threshing is done in nine-men rings, and the silage cutting in five-men rings, the machines being jointly owned, manned, and operated. Four members who are neighbors use a section of pasture land together without cross fences, and have done so for 10 years. And so the effect

An Indian's Laconic Remark Led to the Foundation of North Dakota's Most Prosperous Dairying District, Where the Farmers Gave Up Plowing the Soil and Now Maintain Large Herds on the Prairie-Grass Pastures

of coöperating in securing pure-bred cattle has led them to apply the same principle in manifold ways to obtain the very most out of their farms.

A superintendent is employed who tests the cows of the members regularly, and helps them to keep feed-cost records. The members advertise their cattle as a unit, and show at fairs as a unit. Whenever a pure-bred animal is sold, five per cent of the sale price is put into the joint treasury to be used for promotion purposes.

DESIGN KNOCKDOWN DECKING FOR SHIPPING AUTOS

Because of the great waste of lumber used for decking automobiles for shipment, a collapsible decking that can be used over and over has been patented. The supporting frame is made of castings and steel tubing, and castings are provided for bolting the frame to the car floor. The autos are supported on the hubs or axles, and rest on replaceable wooden blocks. When in position, they are securely held by lugs that fasten to the floor or the frame. When the cars reach their destination, the frames are removed, folded up, and returned to the factory.

This Auto Decking, of Steel Tubing and Castings, Holds the Cars Securely and can be Folded and Returned to the Factory When Cars have been Delivered

OLD-FASHIONED WINDMILL STILL IN OPERATION

A relic of primitive flour-milling methods is a large windmill standing conspicuously on an island in Lake Vänern, Sweden. The main shaft, driven by the wings, is cut from one piece of wood and is 14 inches square. This drives, through wooden gears, a vertical shaft, also of wood, on which are mounted the millstones for grinding the grain. In these days of power-driven rolling mills, such survivals of the kind of flour mill that was once universal are interesting if not very useful.

Old Windmill on an Island in Lake Vänern, Sweden: The Mill is Built Entirely of Wood, Including Its Driving Shafts and Gears

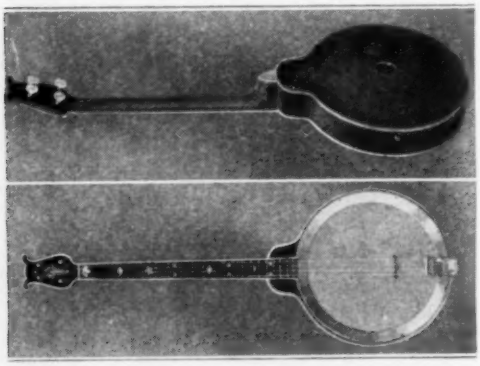
SALESMAN OPENS OFFICE IN LARGE OIL TANK

Having his office in an oil tank of the type he is selling, is the scheme employed by a California tank salesman to interest buyers. A hinged strip cut from one of the plates serves as an entrance, while an opened intake cap is used as a window. The office occupies a corner lot in a residential district.

Appropriate Office of an Oil-Tank Salesman in a California Town

BRACKETLESS BANJO HEADS ADJUSTED WITH ONE KEY

A recent improvement in banjos, mandolins, and similar instruments does away with the old method of tightening the



Banjo with Bracketless Head That is Adjusted Always Evenly, by Means of a Key Inserted in a Lock in the Center of the Back, as Seen Above

head by means of brackets, a method that often led to unequal tightening of the head, one side being perhaps too tight and the other side too loose. This is impossible in the new method, which adjusts the tension on the head suitably by the action of a key that is inserted in a lock at the center of the back of the banjo. With this key the adjustment is made in a second, and cannot be otherwise than perfectly uniform.

CHIMNEY MOVED TO NEW SITE EIGHT FEET DISTANT

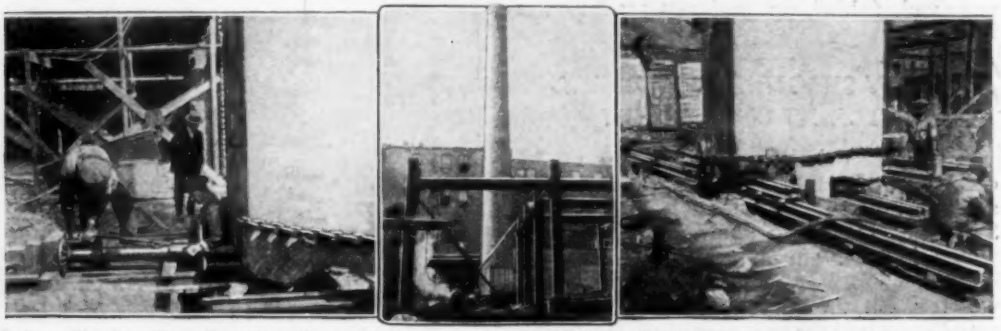
A brick chimney, 88 feet high and weighing 120 tons, stood on the site selected for a new building at Portland, Me., and it was a question of either building around the chimney, tearing it down and rebuilding it, or else moving it bodily. The latter plan was adopted, and a concrete bed was laid for the track, on which steel rollers carried the stack to its new base, about 8 feet away. The actual moving was done by one man with a jack, and was accomplished in three hours, although several weeks were consumed in preparation and in securing the stack to its new foundation.

CULTIVATION OF DAISIES A PAYING ENTERPRISE

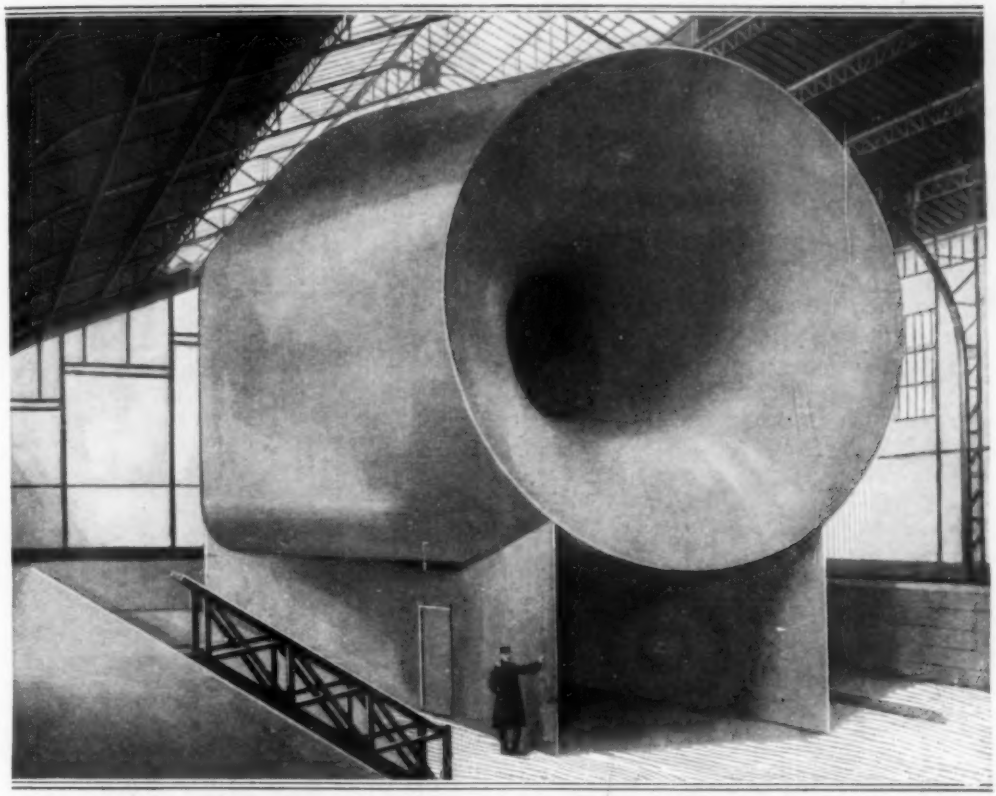
The common white daisy which, when growing wild, is so irrepressible that it is regarded as a pest by the average farmer, has been converted by Luther Burbank, the plant wizard, into a nosegay popular with city dwellers. Burbank developed from the common stock a large beautiful blossom, called the "Maximum" daisy, and an agriculturist in Alabama conceived the idea of cultivating this plant, and selling the cut flowers to city florists. The enterprise has turned out to be quite profitable, and thousands of blooms were first sold in southern cities.

Field under Cultivation with the "Maximum" Daisy, Developed from the Common White Daisy by Luther Burbank: The Blooms are Shipped to City Florists

Recently blooms were sent to New York, where they arrived in good condition.



Left: Showing How One Man Operated a Jack to Move a 120-Ton Brick Chimney. Center: The Chimney before being Moved to the New Foundation. Right: Note Steel Rails Which Served as a Track



Intake End of Large French Wind Tunnel, Used for Testing Airplane Models: Note the Size of the Tunnel in Comparison with the Man Standing near the Base. It Is Nearly 100 Feet in Length and is Constructed of Reinforced Concrete

LARGE FRENCH WIND TUNNEL TESTS AIRPLANE MODELS

The French air service has built a large air tunnel to be used as a test chamber for miniature airplanes and models of parts of airplane structure. It is constructed of reinforced concrete and has an outlet resembling a huge phonograph horn, the mouth of which is 26 feet in diameter, while the tunnel is 10 feet inside diameter and nearly 100 feet long. The air current is created by an electric motor-driven fan of 1,000 horsepower, and can be maintained at a velocity of 186 miles per hour in the test chamber. The unusual dimensions of the tunnel and the high velocity of the air stream are the features of this installation, which is otherwise of standard type.

¶Red, white, and blue-blossomed clematis have been trained by a Washington woman so that, when in full bloom, the effect is an accurate reproduction of the American flag.

NONSINKABLE BATHING SUIT FOR TIMID SWIMMERS

Timid persons who lack a full measure of self-confidence while bathing, may now reinforce themselves in this respect by wearing nonsinkable suits. The garments are made of wool, knitted in the usual way, and have rubber tubes sewed on the inner side, which are inflated with air before the wearer enters the water. The tubes are incorporated in such a manner as to be hardly noticeable, and the outfit can be worn as an ordinary bathing suit when the air is released from the interior.

CONSTRUCT MAMMOTH BARREL AS REFRESHMENT STAND

Built in the form of a huge barrel, a refreshment stand attracts considerable

Refreshment Stand Which was Built in the Shape of a Mammoth Barrel, Showing the Display Windows, Door, and Appropriate Name

attention from the motorists passing along the highway near which it is located. The odd-appearing structure is 20 feet in height, 14 feet in width, and consists of two stories or floors. The ground floor contains the display shelves, ice box, etc., while the upper portion is used as a storehouse for stocks of the goods on sale below.

AIR-MAIL SERVICE GOES YEAR WITHOUT FATAL ACCIDENT

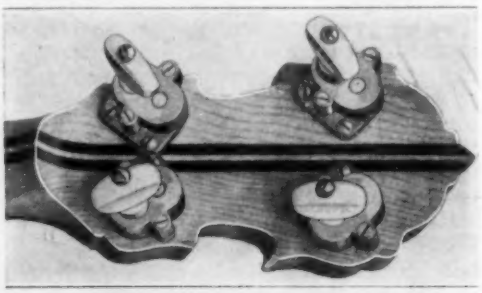
Not a single fatal accident in the air-mail service of the Post Office Department, is the record for the year ended July 16, which proves more conclusively than any other test the reliability and efficiency of the airplane. Flying daily in every kind of weather, the mail planes covered 1,750,000 miles on the New York to San Francisco route, and during that time transported more than 49,000,000 letters, totaling 1,224,500 pounds. This outstanding record is attributed mainly to the experienced pilots who are now familiar with their routes, although it is felt that the abandoning of metal monoplanes, in which a number of fatalities occurred last year, has been a factor.

CARBON DIOXIDE SOFTENS BOILER SCALE

Investigations undertaken at the Mellon Institute of Industrial Research indicate that carbon dioxide is a solvent for the hard scale formed in boilers by some waters, and that it is an easy matter for the power-plant engineer to determine whether scale is susceptible to this treatment by a simple laboratory experiment. A few pieces of scale chipped from inside of the boiler can be placed in a stout bottle or other closed container, so as to be just covered with water, and carbon dioxide admitted from ordinary carbonating equipment, such as used in soda fountains. It should then be left under a pressure of 30 to 50 pounds per square inch, and the results observed at the end of four or five days.

PEG FOR STRINGS OF BANJOS AND OTHER INSTRUMENTS

For holding and tuning the strings of any instrument, but especially of the banjo, a transmission peg that prevents the strings from getting out of tune has recently been patented. The peg is screwed to the face of the head of the instrument, and is operated by turning a small handle, the spindle of which is geared to the peg. It takes three turns of this handle to make one turn of the peg, thus making possible very delicate adjustments.



Transmission Peg for Banjos and Other Stringed Instruments: To Get a Higher or Lower Pitch on a String, the Small Handle is Turned Suitably

SPECTACULAR REPAIR TASK OF LINE FOREMAN

Spectacular in the extreme, describes the task recently performed by a line foreman in repairing a high-tension transmission cable strung across the Straits of Carquinez, in California. These cables carry 110,000 volts and are 135 feet above the water, but despite this great height, a sailing vessel with an unusually high mast, drew down a lightninglike arc from one of the conductors and practically ruined it. To repair the trouble required the trolleying out upon the burned and weakened cable in a small car and working, literally, in midair. It being obvious that the undertaking was a precarious one, a volunteer was asked for. The foreman of the line crew immediately responded and, with groups of awed fellow workmen and spectators anxiously watching him, coolly pulled the little car out upon the swaying cable and repaired the damage.

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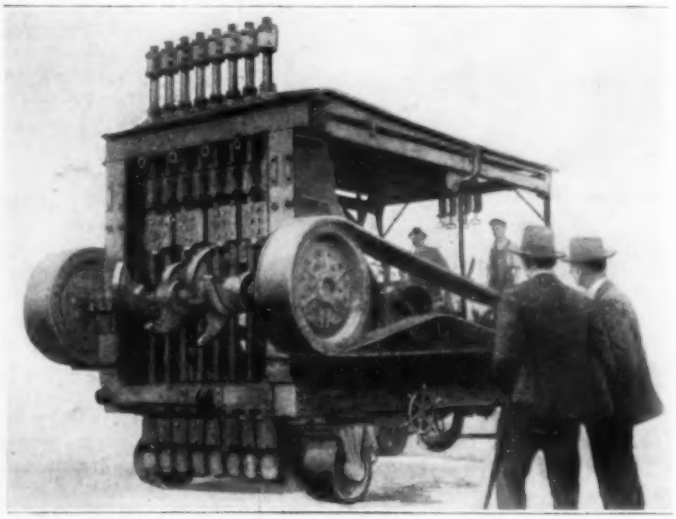
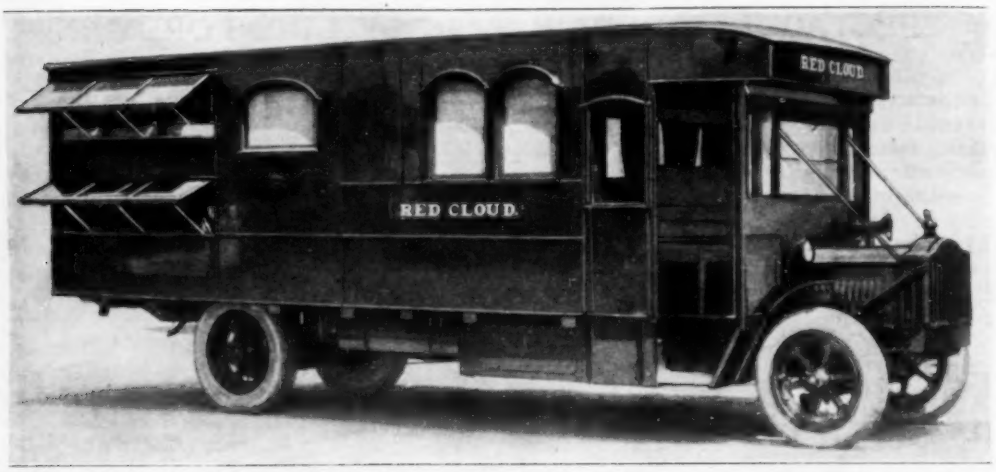
Little Car in Which "Pete" Lindsay, the Fearless Line Foreman, Coolly Trolleyed Out upon the Damaged High-Tension Transmission Cable to Make the Necessary Repairs

CONCRETE-SURFACE CRUSHER FOR ROAD REPAIR

For use in concrete-road repair work a surface-crushing machine has been patented in Great Britain. Mounted on wheels, a strong steel frame supports a battery of eight drop hammers in front of it. These are operated in pairs by rotating cams driven by heavy flywheel pulleys and belts, in connection with a motor at the rear of the machine. With the drop hammers in operation, the machine is moved slowly along the road, and its concrete surface is broken up wherever necessary in repair work. At the end of each hammer is a chisel-shaped cutting tool, which can be removed.



Concrete-Surface Crusher for Use in Road-Repair Work: The Eight Drop Hammers are Driven in Pairs by a Motor in the Rear Part of the Machine. On the Bottom End of Each Hammer Is a Chisel-Shaped Cutting Tool Which can be Removed and Replaced



"Bungalow" on Motor-Truck Chassis That was Constructed for a Wealthy Ohio Man, and in Which He is Now Making a 2,000-Mile Tour of the Eastern States, Accompanied by Three Guests

LARGE PIPE ON BICYCLE ADVERTISES SHOP

A new adaptation of old-world trade symbols is seen in the appearance of a large pipe mounted on the delivery bicycle of a pipe shop. The pipe is about 5 feet long, with its bowl resting upon

The Pipe on the Delivery Bicycle Shown Above Advertises the Shop, and in Addition Is Useful for Carrying Supplies

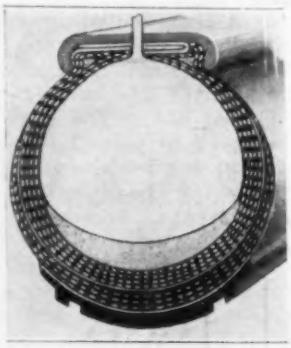
the rear axle and its stem over the handlebars. It has not only proved an effective means of advertisement but is found useful as well, as the bowl can be filled with smokers' supplies when the regular wire basket is overloaded.

"BUNGALOW" ON MOTOR TRUCK HOUSES FOUR TOURISTS

Luxuriousness in motor travel has been exemplified in the building of a veritable "bungalow on wheels," which is now being driven on a 2,000-mile tour of eastern mountains and lakes. The body, which contains a completely outfitted kitchen, living room, and bedroom, is constructed on a special chassis, being 27 feet long, 10½ feet high, and weighing 12,000 pounds. In the kitchen is running water in an aluminum sink; four bunks with full-length windows opposite each are in the bedroom, while the living room has cushioned seats, a collapsible table, a phonograph, and a radio set with a loud speaker.

COTTON REPLACED BY HEMP IN IMPROVED CORD TIRE

For the cotton generally used in cord tires, Bahama hemp is substituted in an improved pneumatic tire recently patented. This should naturally make the tire stronger. Other improvements consist of an inside rubber lining, which, in conjunction with a rubber interlocking device where the tire engages the wheel rim, make an inner tube unnecessary, as the tire casing is air-tight. Inside the lining, above the tread and the full width of it, is a layer of asbestos cement which is flexible and has a tendency to keep the tube cool.



AUTOISTS TRAVEL 6,000 MILES ACROSS EMPTY CONTINENT

Not long ago an expedition of three motor cars completed a successful 6,000-mile trip across central Australia, from Adelaide on the south coast to Port Darwin on the north and back, in 67 days. Experienced travelers and scientists in the party were amazed to find thousands of acres of fertile and well-watered soil and vast grazing plains in this unsettled country. They passed through miles of country without sign of man or beast, and saw great stretches of land with many rivers available for irrigation purposes, the development of which is dependent upon the building of a north and south transcontinental railroad and the introduction of settlers.

LINEMEN BALKED BY TREE CUT THROUGH FOLIAGE

Unable to secure permission to fell a magnificent maple which stood directly in the way, and considering it inadvisable to attempt going above, below, or around it, telephone linemen working near Bloomington, Ill., finally conceived the idea of cutting through the foliage. With the owner's consent enough of the smaller branches and foliage was removed to form a circular opening near the center of the tree. While the "operation," it is claimed, will have no effect on the vitality of the tree, it has given it a most unusual appearance.

The Opening Shown in the Maple Tree Above was Made by Telephone Linemen Working near Bloomington, Illinois, after Vain Attempts to Secure Permission to Fell It

MOVING-PICTURE PROJECTOR FOR SCHOOLS AND HOMES

A moving-picture projector that can be used by anybody anywhere, making possible the projection of moving pictures under all conditions, is in use in France. The lantern and film reels of the projector are supported above an upright triangular frame, at right angles to which is a second triangular frame supporting a seat and a large pulley driven by pedals. The frames are made of polished oak and are very rigid. Behind the large pulley is a dynamo which supplies current for a high-powered incandescent lamp. By means of belts the pedaled pulley operates the dynamo, the projector, and the film reels all simultaneously. Films used in moving-picture theaters, or special educational films, can be thrown on a screen about 5 feet wide, large enough for most schools or homes.

Pedal-Driven Moving-Picture Projector Which Generates Its Own Electricity: The Large Pulley Drives the Dynamo and Film Reel

¶When you want anything and do not know where to get it, write Bureau of Information, Popular Mechanics, Chicago.

IMPROVED DEVICE SPEEDS UP HANDLING OF MAIL

A new machine designed by the staff of the mail-equipment shops of the Post Office Department, will greatly facilitate the work and effect a saving of about $2,000 over each of the older units which it will supersede for systematically arranging letters preparatory to cancellation. This so-called "pick-up" or "facing" table is operated by a ½ or 1-horsepower motor, and has a stationary circular top with a revolving under platform surrounded by two circular slots which provide facilities for both large and small envelopes. Eight men can stand around the table and deposit letters in the slots, which revolve eight times a minute and stack the envelopes into packages.

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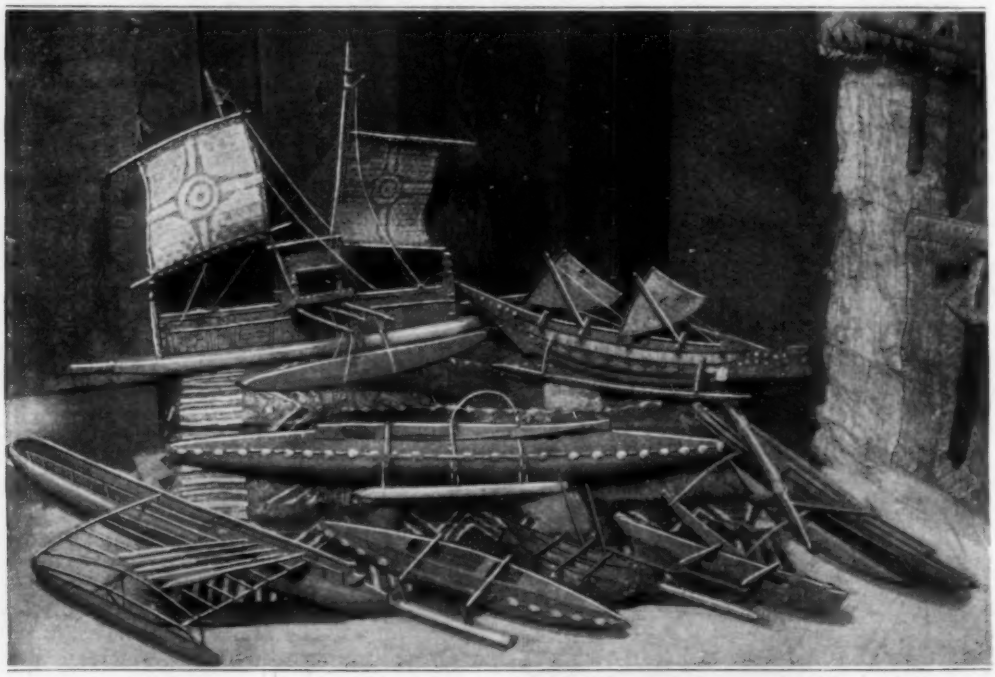
This "Pick-Up" Table will be Used in the Larger Post Offices to Speed Up Cancellation of Letters. Eight Men Sorting Out the Large and Small Envelopes can Work around It



MODELS OF VARIOUS BOATS USED BY SOUTH SEA ISLANDERS

THE result of 25 years' effort by a resident of Canada is a curious collection of models of the many varied types of boats used by South Sea islanders. Among the models, all of which were made by natives, are a New Guinea war canoe with its fighting bridge, on which archers stand, between its sails; double canoes from Tongareva Island; canoes decorated with seashells from Savage Islands, and examples of nearly every kind of craft from the New Hebrides, from Samoa, and from many other islands of the Pacific. There is also, at the extreme right, a model of the pearl-fishing canoes, used by the natives of Ceylon, and so similar to the South Sea islanders' craft as to offer an interesting comparison.

One of the New "Listening Counters" Which have been Recently Introduced for Use in Music Stores and at Which the Prospective Buyer may Sit and Hear the Phonograph Records, Thus Enabling the Store Proprietor to Economize Space by Doing Away with the Customary Booths

PHONOGRAPH RECORDS CHOSEN BY USE OF EAR TUBES

"Listening counters" are innovations for music stores, to economize space by doing away with the booths in which the prospective customers play phonograph records before making their selections. The counters have a series of compartments, each containing a talking machine, the tone arms of these being connected to rubber tubes which the buyers place to their ears, thus enabling them to hear the melody without interference from the adjoining machines.

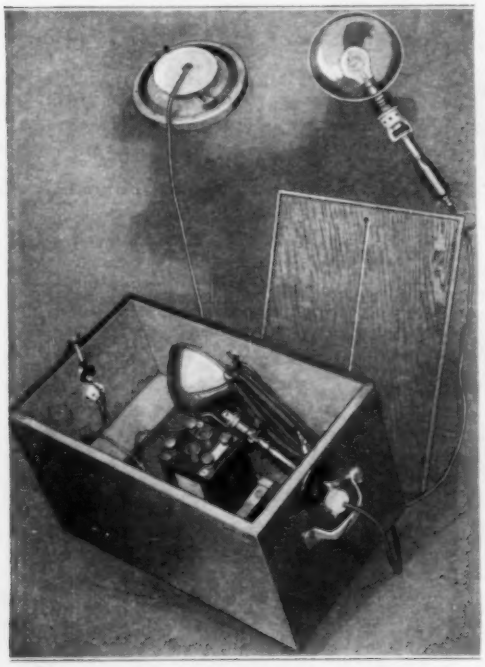
NEW PAINT-SPRAYING MACHINE LIGHT AND COMPACT

A portable paint-spraying outfit, recently placed on the market, is distinguished by its compactness and lightness, weighing, with its carrying case, only about 28 pounds, so that a workman can take it along to any job where there are facilities for running it. Its air compressor is driven by an electric motor which consumes about as much current as a 40-watt lamp. The compression cylinders, which are arranged one at either end of the motor, have fins like those of an air-cooled engine.

Portable Paint-Spraying Machine Distinguished by Unusual Lightness, So That a Workman can Carry It from One Job to Another

OSCILLOSCOPE ALLOWS STUDY OF HIGH-SPEED MACHINES

High-speed machinery can be studied at .01 of its actual velocity with the aid

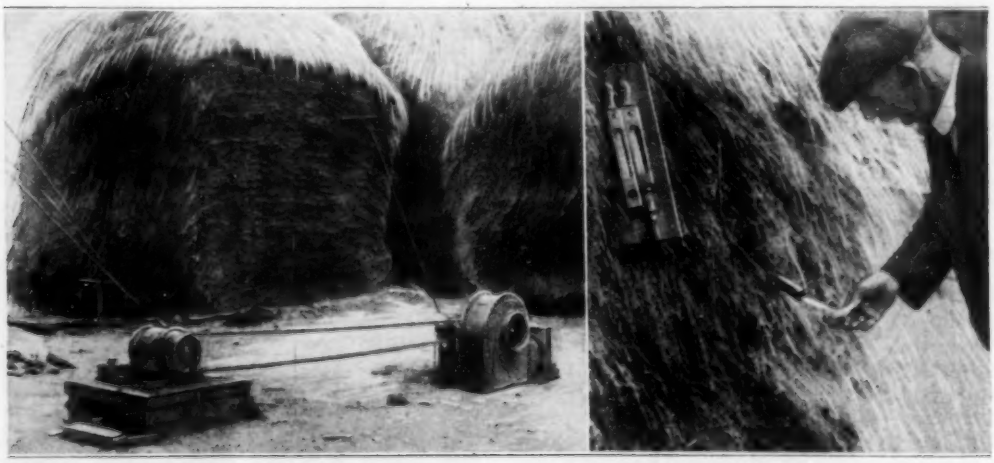


Electrical Oscilloscope Which Enables High-Speed Machinery to be Studied at a Rate of Only One-Hundredth of Its Actual Velocity

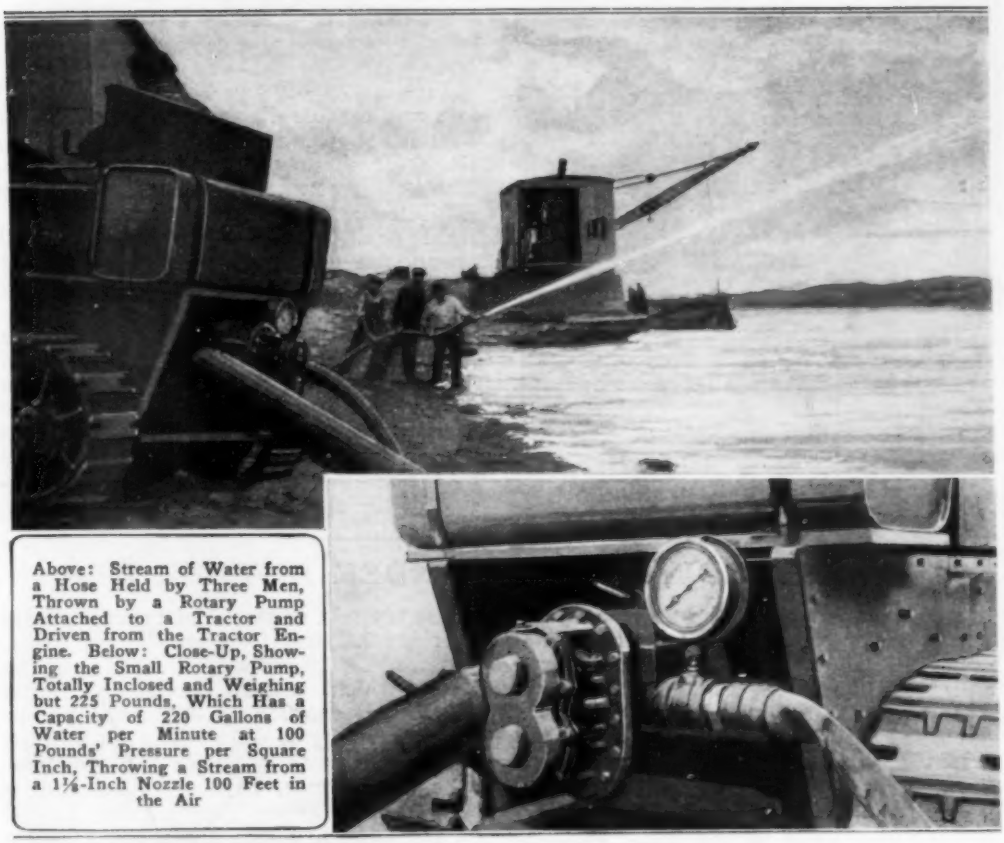
of an oscilloscope which is now being produced in portable units by an English company. The outfit consists of a small storage battery, two specially designed electric lamps and reflectors, and a special switch, or contact breaker. Extension cords are provided for the lamps and contact so that they can be moved freely about while connected to the battery. In operation, the machine to be studied is placed in a darkened inclosure, and to its shaft a cam, or wheel, is geared at a 100-to-101 ratio, or 1 per cent slower than the machine shaft. The contact is then fastened to the cam, and at every revolution switches on the brilliant lamps for just an instant. The observer, of course, only sees the machine while it is illuminated, but if the shaft is turned fast enough, these illuminations, appearing .01 of a revolution apart each time, blend together. Thus the observer can see the entire revolution of the machine shaft at only .01 of its original speed, giving ample time to perceive any defects or peculiarities which would lower the efficiency of the machine.

ELECTRIC BLOWER FAN USED TO CURE HAY

Curing stacks of hay with an electric blower fan outfit, is the method employed by an English farmer-scientist, which enables him to treat his large crops without having to depend upon the sun's assistance. The grass is stacked as quickly as it can be hauled to the selected spot, the stacks being built in the usual manner but having in their centers an air chamber to which the fan is connected. The excessive heating, due to the action of the fermentation bacteria, is kept within safe limits by intermittent blowing, thermometers being used to observe the temperatures of the different stacks.



Left: Haystacks being Cured by an Air Blast from a Powerful Blower Fan Driven by an Electric Motor. Right: Taking the Temperature of a Haystack with a Thermometer Fastened to the End of a Stiff Wire



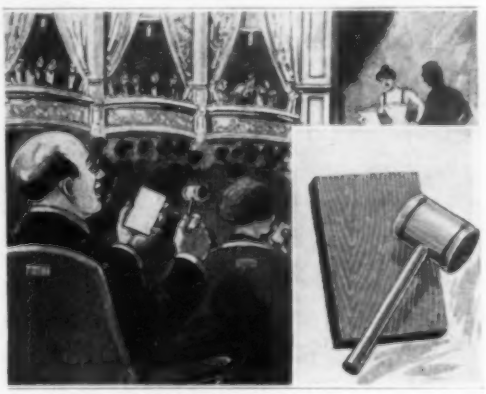
Above: Stream of Water from a Hose Held by Three Men, Thrown by a Rotary Pump Attached to a Tractor and Driven from the Tractor Engine. Below: Close-Up, Showing the Small Rotary Pump, Totally Inclosed and Weighing but 225 Pounds, Which Has a Capacity of 220 Gallons of Water per Minute at 100 Pounds' Pressure per Square Inch, Throwing a Stream from a 1⅛-Inch Nozzle 100 Feet in the Air

ROTARY PUMP HAS MANY USES APPLIED TO TRACTOR

A rotary pump, specially built with reference to its adaptation to tractors, offers interesting possibilities of practical value. The pump is designed with all working parts inclosed, so that the load is taken by driving gears with no metal contact between the blades, and with a positive jaw clutch for disconnecting from the power. It has a capacity of 220 gallons of water per minute at 100 pounds' pressure, and will throw a 1⅛-inch stream 100 feet in the air, requiring 26 horsepower. It will be useful in forest-patrol, municipal fire service, irrigation, and for contractors' work.

APPLAUSE FROM AN AUDIENCE ARTIFICIALLY STIMULATED

Any hesitation of an audience to start applause, and to continue it with increasing volume when once started, is dispelled by a very simple means of stimulating applause now in use in a theater in Havana, Cuba. Each member of the audience is furnished with a piece of hardwood, about 2 inches by 3 inches in size and ¼ inch thick, together with a small wooden mallet. With these in their hands the temptation is strong to use them, and the custom has been for the applauders to keep time with the music.



Applause Stimulator Seen in Operation in the Hands of the Member of the Audience in the Foreground. The Device, as Shown in the Inset, Consists of a Small Piece of Hardwood and a Mallet

Flower-Display Holder, Showing the Stand and Pot Holder; Also How Potted Plants may be Exhibited

FLOWER-DISPLAY HOLDER FITS ANY-SIZE POT

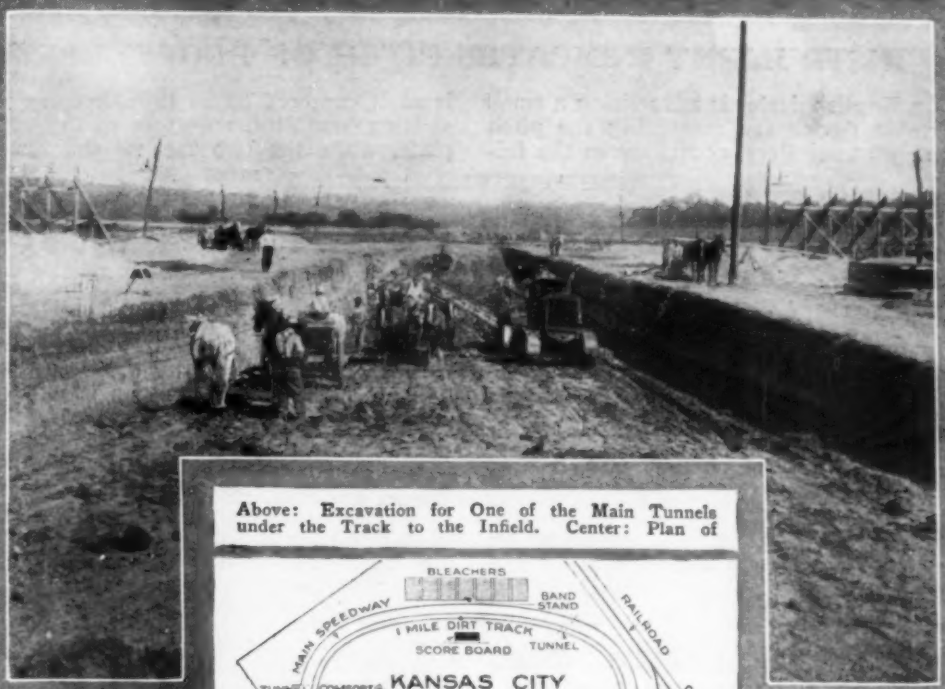
Flowerpots of any size may be placed in an adjustable display holder for use in florists' shops, at weddings and receptions, for window trimming, and the like. The holder permits the potted plant to be exhibited at various angles, or in an upright position, or even to be whirled around on the stand without danger of being thrown out. The fixtures, being made of brass, are practically indestructible, and are so constructed that the metal framework can be easily wrapped or draped if a further decorative effect is desired. When watered, the "drip" is caught in a small basin at the base of the holder, whence it may be drained away by the removal of a cork from the underside of the small catch basin.

AUTO SPEEDWAY BUILT UNDER DIFFICULTIES

The construction of the new speedway at Kansas City, Mo., presented unusual difficulties, owing to the fact that the city and vicinity are hilly, making it impossible to locate the speedway, which was to cover 192 acres, on a level site, and to the brief time limit imposed by the scheduled opening for the first race. Added to this, water was encountered five feet below the surface over most of the area. A large hill had to be cut away, and a ravine, through which ran a creek, was converted into one of the tunnels from the outside, underneath the tracks to the infield, the creek being diverted for this purpose. These tunnels, of steel and concrete, form a bridge 125 feet long and 90 feet wide, and are tiled to reduce the seepage of the water which collects in sumps, from which it is emptied by automatic pumps with a capacity of 480 gallons per minute.

Bridging a Ravine Where a Concrete Structure will Carry the Speedway Tracks for a Distance of 125 Feet and Form One of the Tunnels Leading to the Infield

The oval track is a mile and a quarter in circumference, 50 feet wide, and is banked from 7° on the stretches to 40° on the curves, where it reaches a height of 25 feet. The track is built entirely of yellow pine, 4,000,000 feet being required, and is calculated to be the fastest in the world, with a safe speed of 120 miles per hour. The grand stand and bleachers, of steel construction and each with a seating capacity of 17,000, are located on opposite sides of the track, and each was completed in 7 days by a force of 500 men working on one shift. A 40-foot safety zone with 8-inch creosoted-oak posts protects the spectators. A 1-mile dirt track is within the speedway for horse racing, and the infield provides parking space for about 5,000 automobiles from which the racing can be viewed, while 17,000 more can be parked outside the speedway track but within the inclosure.

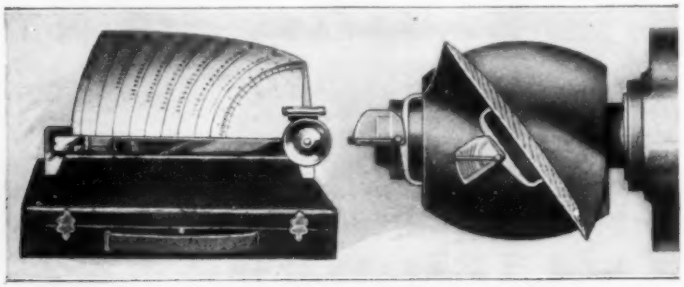


Above: Excavation for One of the Main Tunnels under the Track to the Infield. Center: Plan of

Large Automobile Speedway. Below: Large Steel Grand Stand Erected in Seven Days

INSTRUMENT INDICATES PITCH OF PROPELLER

An English dealer is advertising a small portable device for measuring the pitch of screw propellers, according to the following method: First, radii are drawn on the blade at 2-foot intervals from the center of the boss; then the bubble of the level is centered in its tube, keeping the shifting arm at the bottom of the index plate, while the two feet of the instrument are held against the boss or nut of the propeller; next the instrument is transferred to the blade of the propeller so that the feet will rest on the first radial line, and the arm shifted, without interfering with the level, until the bubble is centered. The pitch can then be read at the point where the top of the arm crosses the arc marked "2 feet" on the index plate. The pitch at the other radial lines is found in a similar manner.

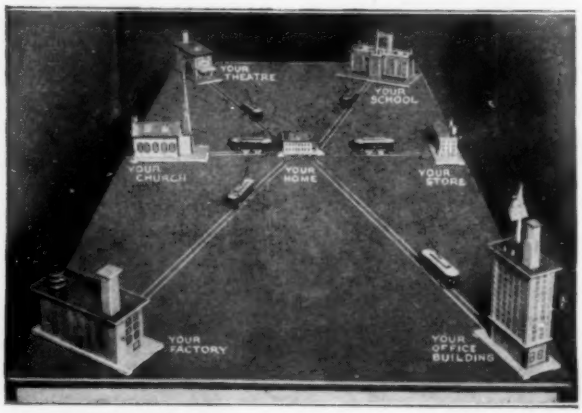


Left: Close-Up of Instrument for Measuring Pitch of Screw Propeller. Right: Instrument Shown in the Two Positions Required to Measure Pitch

STORM WRECKS LUMBER BARGE, CARGO STREWN ON BEACH

Wreckage similar to that usually left in the path of a tornado, was strewn along a mile of beach at the mouth of the Umpqua River, in Oregon, recently, when the large lumber barge "Washtucna" was driven onto a sand spit by a severe storm. The high winds and waves that proved so disastrous to the heavily loaded craft, dashed the lumber around with such force that it was rendered commercially worthless. Some 800,000 feet of the product still remain in the hold of the barge, and plans are being considered to bring this safely ashore.

Splintered and Broken Cargo Washed Up on the Beach When the Heavily Loaded Lumber Barge "Washtucna" was Wrecked off the Oregon Coast Recently



This Exhibition, Demonstrating the Benefits of Street Railways, was Displayed at a Better-Homes Show in Baltimore

BENEFIT OF STREET CARS SHOWN IN BALTIMORE BY MODEL RAILWAY

The benefit of street railways was demonstrated in an interesting manner at a better-homes show recently held in Baltimore. A model home was built in the center of an oblong platform, and railway lines with small cars running on them were shown radiating in six directions to other miniature houses representing an office building, a factory, a theater, church, school, and store. The table was built by a local traction company.

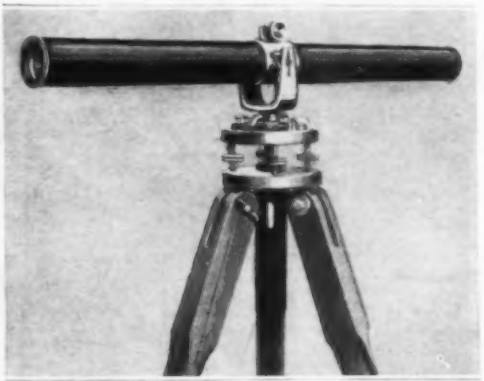
Famous Aerial Bridge at Duluth, Minnesota, Which It is Contemplated to Replace with a Tunnel: It Spans a Ship Canal across Minnesota Point. The Bridge Is 400 Feet Long, and the Traveling Carriage is Suspended from Supports (Unseen in the View) That Are 186 Feet above the Water

TUNNEL PLANNED TO REPLACE AERIAL BRIDGE AT DULUTH

Construction of a tunnel to replace the well-known aerial bridge at Duluth, Minn., is under consideration by the city council. The bridge is getting old and becoming unsafe. Not long ago the traveling carriage failed to work, and remained fixed over the channel right in the course of an approaching steamship, causing a panic. The bridge spans a ship canal across Minnesota Point, where there is heavy automobile traffic, particularly in the summer. The proposed tunnel would provide street-car service, and would also facilitate the automobile traffic, which is now handled so slowly by the aerial bridge.

ACCURATE METHOD OF TIMING AIRPLANE SPEED

The essential feature of a new method of timing the speed of an airplane over a measured distance, is a transit instrument consisting of a telescopic line of sight with cross hairs, and having vertical and horizontal adjustability. The outer horizontal circle carries a movable arm that can be clamped and is designed to make electrical contact with a collar on the spindle, thereby energizing a magnet which controls the starting of a stop watch. In making the observation, two instruments are used, each set up at right angles to opposite ends of the measured

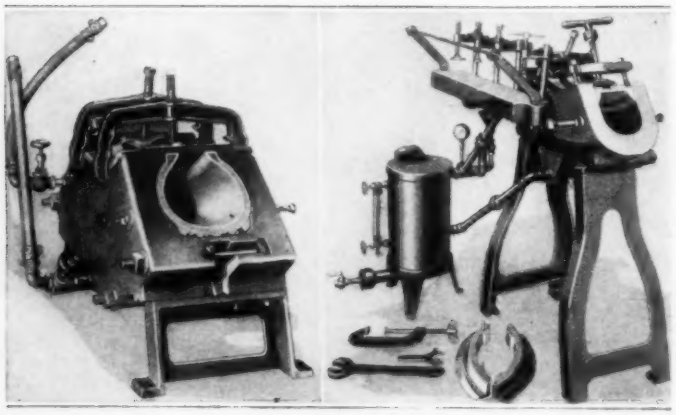


Transit Instrument, Two of Which are Used in Connection with Stop Watch and Electric Circuit for Timing Airplane Speed

course, the first one being adjusted to start the watch as the plane crosses the line of sight and the second to stop the watch as the plane passes its line of sight.

¶A preparation in liquid form, which when applied to a "run" in silk hose prevents further raveling until the fabric can be mended, is now on the market.

ADJUSTABLE MOLD FOR TIRES OF ANY SIZE



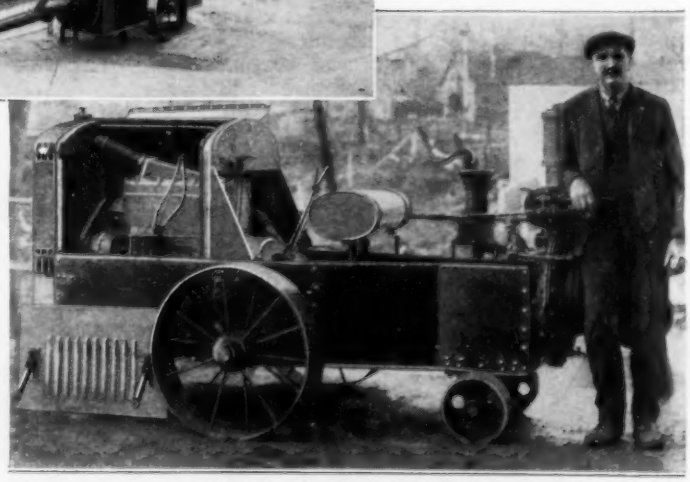
Left: Single-Cavity Mold Which Is Adjustable to Accommodate Truck Tires Ranging from Five to Nine Inches. Right: Single-Cavity Mold That can be Adjusted to Fit All Sizes of Passenger-Car Tires

Adjustability to within a fraction of an inch, both laterally and perpendicularly, so that all sizes of cord or fabric tires can be perfectly fitted, is the outstanding feature of a new vulcanizing mold. The mold is constructed in halves, held together by bolts, and can be made to fit any standard tire by the use of spacers between the halves for the larger tires, and reducing shells for the smaller. The equipment saves first cost, fuel, and space.

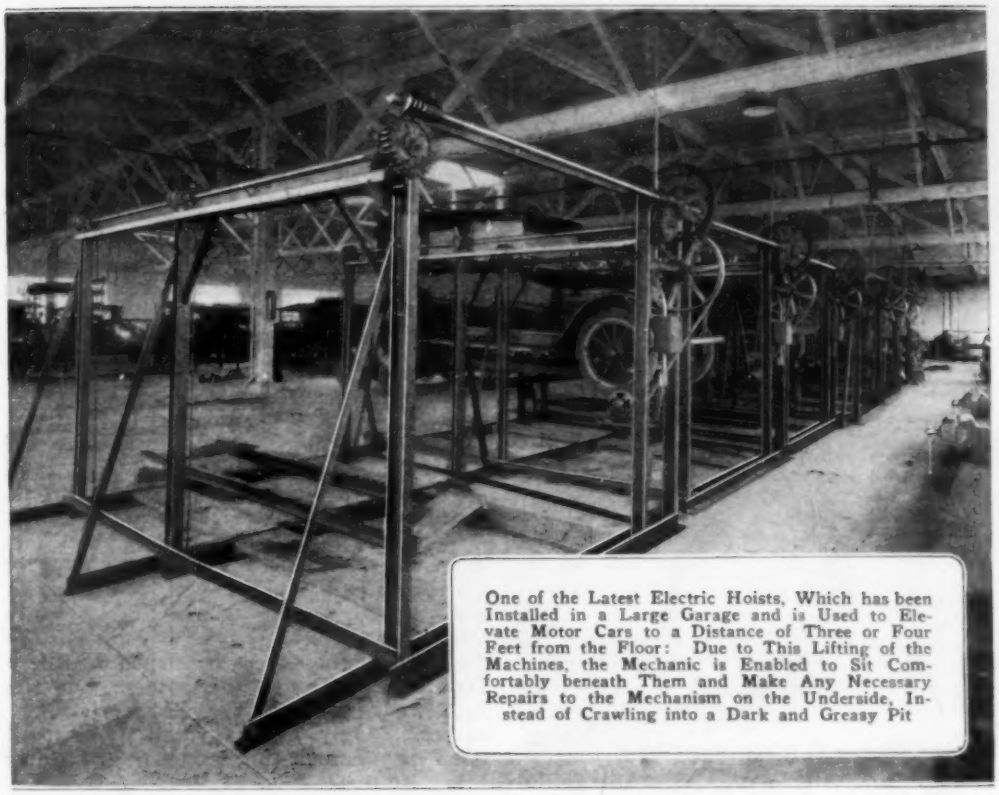
AUTOMOBILE MOTORS USED IN PUMPING OUTFITS

In specially constructed frames, mounted on wheels, standard motor-car power plants, including radiators and hoods, have been installed in connection with portable pumping outfits in use by the Denver municipal water plant. The motors are at one end of the framed carriage, and their shafts are direct-connected with flexible couplings to the shafts of centrifugal pumps mounted at the other end. Priming pumps and other accessories are provided. Two sizes are in use, one with a light automobile engine and a centrifugal pump that delivers 450 gallons of water per minute with a 12-foot suction lift. The larger outfit has a powerful truck motor, and a centrifugal pump with a capacity of 900 gallons per minute. Two of the smaller units have been in use for about five months, operating continuously from 8 to 10 hours a day.

The Smaller of Two Sizes of Portable Pumping Outfits Seen at Work at the West Side Station of the Denver Municipal Water Plant



The Larger Size Portable Pumping Outfit, Showing Its Powerful Motor at One End That Drives the Centrifugal Pump at the Other End, with a Capacity of 900 Gallons per Minute: By the Side of It Is the Priming Pump



One of the Latest Electric Hoists, Which has been Installed in a Large Garage and is Used to Elevate Motor Cars to a Distance of Three or Four Feet from the Floor: Due to This Lifting of the Machines, the Mechanic is Enabled to Sit Comfortably beneath Them and Make Any Necessary Repairs to the Mechanism on the Underside, Instead of Crawling into a Dark and Greasy Pit

MOTOR CARS HOISTED IN AIR FOR UNDERSIDE REPAIRS

Repair work on the underside of motor cars has been made easy by the introduction of an electric hoist which raises the machine 3 or 4 feet from the floor. The lifting appliance is a structural-steel framework of I-beams and angle irons. The car is run upon a base and then elevated by means of a cable drum driven by an electric motor, until the desired height is attained. The installation of this apparatus does away with the necessity of crawling into a dirty pit under the machine and speeds up the repair work, thus proving a time and money saver for the garage man as well as the car owner.

AMUSING SIGNS ON WINDOWS OF RIVAL REPAIR SHOPS

"We Weld & Repair Anything but the Break of Day," reads the sign displayed on the window of a repair shop in Phoenix, Ariz., by which the owner of the shop, evidently worried because of the success of a competitor in the same block, hoped to hold his share of business. Not in the least nonplused, his rival, a short time later, decorated his window with this announcement: "We Weld and Repair Anything but a Broken Heart."

Signs Displayed by Rival Repair Men in Phoenix, Arizona: The Shops Are in the Same Block

GARDEN-HOSE ROLLER CLAMP REPLACES CLUMSY REEL

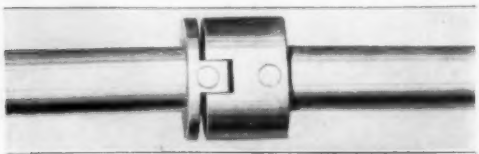
Garden hose can be quickly and easily rolled up into loops of any desired size by the use of a simple appliance pro-

Garden-Hose Roller Clamp, of Which an Enlarged View is Shown, can Also be Seen at the End of the Hose, Making the First Loop

duced by a northwestern manufacturer. The contrivance is a spring clamp that fits over and firmly holds the first two loops of the hose, after which the remainder can be rapidly rolled in a neat coil without using a clumsy reel.

FLEXIBLE SHAFT COUPLINGS OF SIMPLE CONSTRUCTION

A flexible shaft coupling of exceptional simplicity, and of positive action, now being manufactured, consists of two rings, one with a tongue and the other with a groove that fit together. In its



Tongued-and-Grooved Flexible Shaft Coupling in Its Simplest Form: Larger Sizes Have Hubs That are Keyed to the Shaft Ends

simplest form, these rings are drilled transversely with holes that are in line with the tongue and groove, and pass through the ends of the shafts that are to be coupled. In these holes hardened pins are inserted, and the power is transmitted through them from one shaft to the other. Thus any parallel misalinement is taken care of by the tongue sliding in the groove, and any angular misalinement by the articulation around the driving pins. In couplings for larger shafts, hubs are keyed to the shaft ends, and the hardened pins are driven transversely into them instead of through the shaft.

ARGENTINE CORNCRIBS BUILT AS SELF-FEEDERS FOR HOGS

Corncribs, made with a few poles and woven-wire fencing, are commonly used in the hog-producing parts of Argentina. Corn and alfalfa are the two feeds depended on for fattening the animals. The cribs are usually placed in the center of an alfalfa field. The fodder is allowed to get a good growth before the hogs are turned in. When they are admitted, the fence of the corncrib is turned up for a foot or two around the bottom, and the pigs very soon "make hogs of themselves." Only a very small amount of corn is wasted, the value of which is

One of the Corncribs Constructed of Woven-Wire Fencing and Placed in Alfalfa Fields as Self-Feeders for Hogs

counterbalanced many times over by the economical method of feeding.

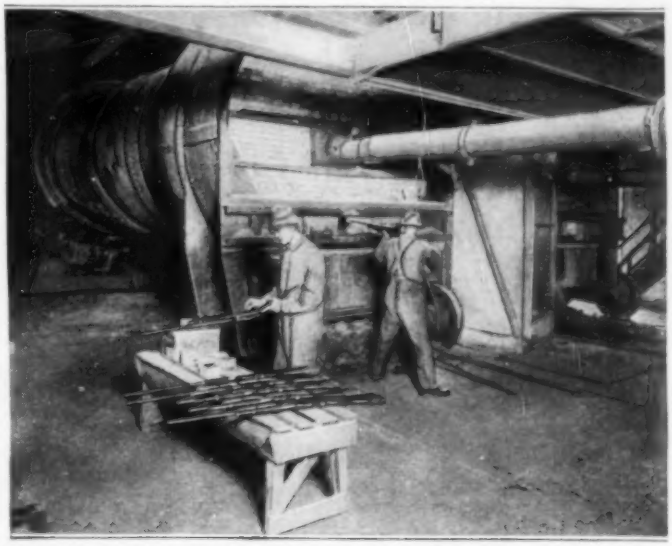
¶For relief of the increasingly heavy cross-river traffic, a new bridge is to be built in London, England. It will be known as St. Paul's bridge, because it will span the Thames from a point just opposite the cathedral. It is to have a roadway width of 80 feet.

ROTARY CEMENT KILNS CLEANED WITH SHOTGUN

Everyone knows that in an active volcano a crust of lava forms around the circumference of the crater. In the making of cement, a similar crust, or "ring" as it is called, forms in the long cylindrical kilns. The heat is so intense that the ground stone and other raw materials fuse into a solid mass. This "burning" is the most expensive and most important of the nearly 100 processes required to convert the raw materials into modern Portland cement, and calls for about 200 pounds of coal for every 376-pound barrel of cement made.

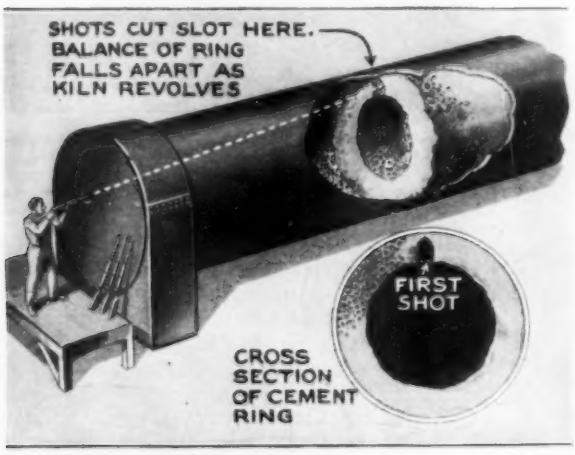
As this ring gradually grows thicker, and sometimes as long as 8 feet, it must be occasionally removed. When it has formed far from the working end of the kiln, it has been found more economical to shoot it away with balls fired from a shotgun than by shutting down the kiln and jamming or wedging it out.

At first the shells were charged with duck shot, but these were not strong enough. More recently one-ounce lead balls, similar to those used in a "deer load," are employed. A long-barrel, 12-gauge repeating shotgun is the most commonly used. Once a wedge is cut from the ring and the kiln is again made to rotate, the remainder of the ring breaks down.



Using Shotguns to Clean the Crust, or "Ring," Out of a Cylindrical Cement Kiln, Showing the Workmen Standing outside the Kiln and Firing Heavy Deer Shot Until a Wedge is Cut through the Ring

When the shotgun method is not used, it is necessary to shut down the kiln, allow it to cool sufficiently to permit men to enter, and then jam or wedge it out by hand. This requires anywhere from one to two or three days, and entails an operating loss of about $1,000. With the shotgun process, the ring can be removed in from one to two hours, and requires about $50 worth of shot, proving the economy of the method.



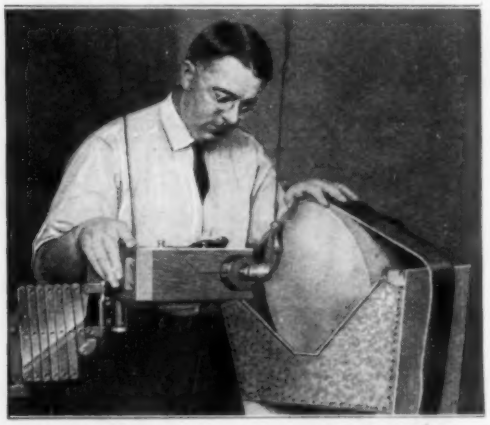
Phantom View of the Cement-Kiln Crust, Which can be Removed at a Far Less Expense with Shotguns than by the Old Method of Cutting It Out by Hand

LARGE RADIO STATIONS IN CENTRAL AMERICA

One of the most important radio developments to be reported in recent months is the placing of orders by a large fruit company and a tropical radio concern, for the erection of three 2,000-mile range wireless stations in Central America. Managua, capital of Nicaragua, will have one station, another will be constructed at Tegucigalpa, capital of Honduras, while the third will be located at Almirante, Panama.

SWISS CHEESE IS EXAMINED WITH X-RAY MACHINE

Examining Swiss cheese with the aid of an X-ray machine is the method now in use at the Department of Agriculture,



X-Ray Machine for Examining Swiss Cheese, Showing How the Product is Placed in a Special Holder While Its Interior is Illuminated

and one which is said to be an entirely new departure in this line. The cheese is first placed in a special holder, or frame, after which the dairy specialist employed by the government can quickly determine, with his electrical apparatus, the presence of any defect in the interior of the product.

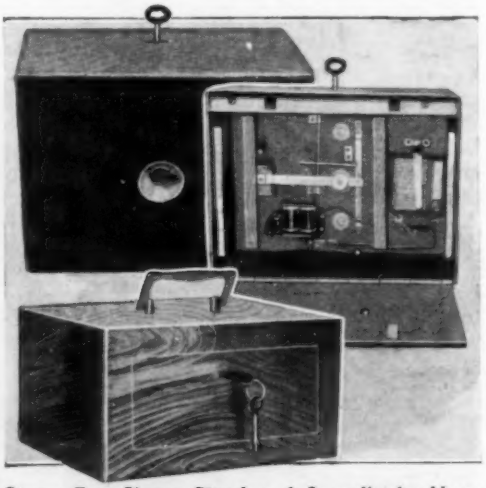
AUXILIARY AUTOMOBILE TANK IS USED AS A FOOTREST

An auxiliary tank for automobiles, which may be used for gasoline, water, or oil, or may have partitions dividing it into compartments for all three, has been patented by an English inventor. It is triangular in shape, and is placed in the tonneau at the back of the front seat, and under the floor rug, where it forms a comfortable footrest for passengers in the rear seat, thus serving another useful purpose.

Auxiliary Gasoline, Oil, or Water Tank for Automobiles: Placed under the Floor Rug behind the Front Seat, It Forms a Footrest for the Rear-Seat Passengers

STRONG BOXES SAFEGUARDED BY LOUD-SOUNDING ALARM

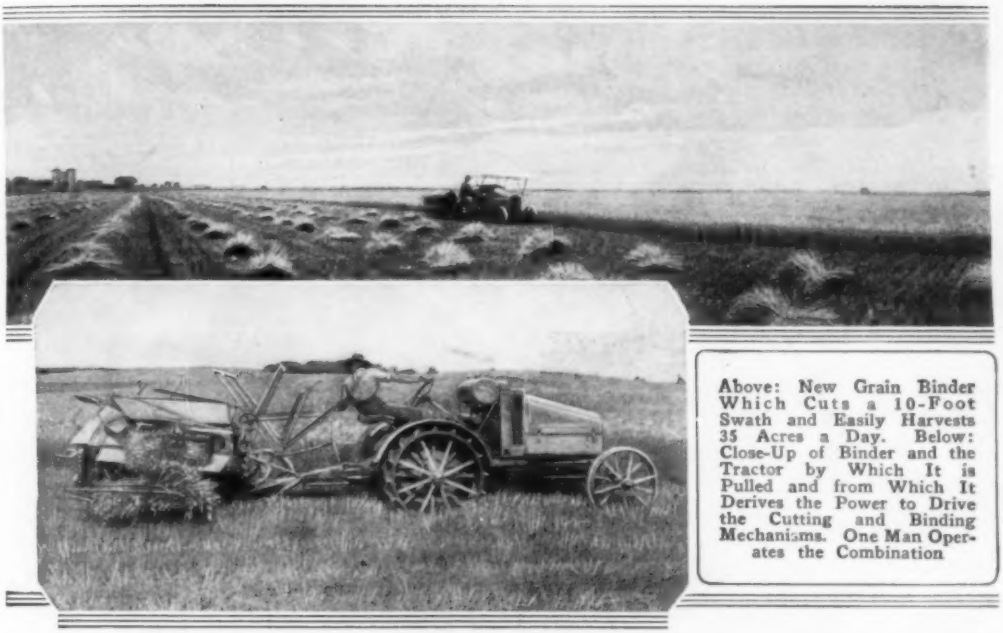
Protection against any tampering with a small safe or strong box is afforded by means of a loud-sounding alarm inside the box that starts the moment the box is moved even a fraction of an inch, and that cannot be stopped until the box is opened. Beneath a false bottom inside the box is an electric buzzer, to which is connected a small hammer that pounds rapidly on the side of the box. The buzzer is operated by a dry battery, the current from which is switched on by a contact device that is closed automatically by the slightest movement of the box. This is caused by the action of a small rod that protrudes from the bottom of the box holding up the contact



Strong Box Shown Closed, and Immediately Above, Opened with Its False Bottom Removed, Exposing the Electric Alarm: This Operates by Any Movement of the Small Rod Seen, at Left, Protruding from the Bottom of the Box

maker as long as its end is resting on any flat support such as a table or shelf. The slightest movement of this rod closes the electric circuit. The only way to break the circuit is by means of a switch inside the locked box.

¶Widening the Panama Canal at Gaillard Cut, by shortening La Pita Point, is being done to reduce the possibility of slides, and to give a clear view to pilots of meeting ships.



Above: New Grain Binder Which Cuts a 10-Foot Swath and Easily Harvests 35 Acres a Day. Below: Close-Up of Binder and the Tractor by Which It is Pulled and from Which It Derives the Power to Drive the Cutting and Binding Mechanisms. One Man Operates the Combination

NEW GRAIN BINDER CUTS 35 ACRES A DAY

A grain binder that enables one man to cut nearly twice as much as with any earlier type is a recent development in the implement field. This new binder, which cuts a 10-foot swath, differs from all others in that the power for driving the mechanism does not come from the main wheel, but from the tractor which pulls it. Independent of slippage of the binder wheels, this steady supply of power enables the binder to be run at a more uniform rate of speed and makes it possible to cut the wide swath, as well as permitting operations in soft ground and where the grain lies low. It reduces the hazards facing the farmer at harvest time.

WHEAT CUT, THRESHED, GROUND, AND COOKED AT ONE TIME

By adding a small gristmill and an oil stove to the equipment usual in connection with the machinery required for harvesting and threshing wheat simultaneously, the crew was furnished with hot baked biscuits at the end of one trip around the large field, made from wheat harvested during the previous round. The wheat was ground in an old family gristmill, a relic of pioneer days, and the baking was done in an oil stove, set up on a near-by road and shielded from the wind by an umbrella. This unusual performance took place last July on John Rueschhoff's farm near Grinnell, Kan. Two women attended to the baking.

Left: Combined Harvester-Thresher at Work. Above: Baking Biscuits Made from the Wheat Just Harvested, and Ground in a Small Gristmill. Right: Harvester Crew Eating the Hot Biscuits

IDLE SHIPYARD ADAPTED TO UNDO OWN WORK

By D. R. LANE

RECENT experience in scrapping naval vessels on the Pacific coast brings to light the fact that shipyards — intended primarily for building vessels — can be adapted to the reverse operation to an extent well worth while from the viewpoint of owners who otherwise would see them standing idle for lack of orders.

At one yard where construction facilities thus were used for demolition, there was developed a plan for beaching the broken hulks on the sloping foot of the launching ways, to avoid renting a drydock for the final stages of the work; ordinary city gas was substituted successfully for acetylene or hydrogen in oxygen-cutting torches, and explosives were used in a variety of ways believed new to ship breaking.

Former Cruiser "Minneapolis," Showing the Protective Deck, Which Was Four Inches in Thickness and Composed of Three Plates, Blind-Riveted Together, after Cutting by Gas Torches

The vessels broken up at this yard were the "Marblehead" and "Minneapolis," of 2,089 and 7,375 tons, respectively. The cruiser "Brooklyn," 9,215 tons, was largely cut up at a junking yard near by, but the hulk was brought to the shipbuilding plant in question to be beached and broken up. While none of the three ships would be considered a large vessel, by modern naval standards, the methods employed in breaking them were chosen with an eye to efficiency and economy, and the work was arranged in such a manner that the experience gained might serve as a foundation for operations on the larger craft soon to be sold for scrapping. In general, the process of demolition was exactly the opposite of that of construction. The vessels were laid up alongside what had been the shipyard's fitting-out wharf, wreckers stripped them of woodwork, and riggers and fitters removed as units the fixtures which could be sold entire. Then torch men cut the ships down, course by course. When the hulk was so shallow that it could not be safely left floating, it was towed over the foot of the launching ways, tackle was rigged from deadmen up the ways over sheaves shackled to the hulk, and the cranes hauled up on the tackle. Advantage being taken of the tide, little difficulty was experienced in floating the hulks well up over the foot of the ways and then skidding them up the incline the rest of the distance. Beaching in this manner enabled the wreckers to get all the material from the hulk, instead of losing the last few hundred tons, as is usual with ships beached on mudflats, and saved the cost of a drydock, which would have been out of all proportion to the profits of the enterprise.

In the wrecking work, large engines were broken up with explosives; small ones were cut out with the torch. Explosives were also used to start balky bolts, half a stick of dynamite doing the work cheaper and quicker than an hour's sledging. The propeller hubs were started off the tailshafts by the same method. As these were taper-fitted and pressed on by hydraulic rams, considerable difficulty had been anticipated, but a moderate charge of explosive loosened each one nicely.

Explosives came into play again in the close spaces of the lower part of the hull where the steelwork had been coated with cement. It was cheaper to crack the cement, or even to break a few inches of steel framing, with explosives than to chip out the steel with the torch.

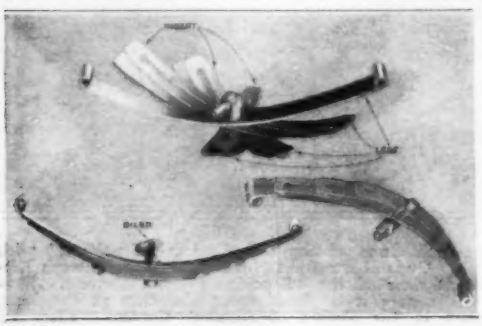
The city gas was used for cutting torches, partly because of its cheapness, but mostly because tests showed that faster work could be done with it than with any other fuel available. A high-

Above: Operator at Work Cutting Up One of the Eight-Inch Guns of the Old Cruiser "Brooklyn," with Torches Using City Gas Instead of Acetylene or Hydrogen. Guns of Scrapped Naval Vessels are Always Disabled before Sale. Below: Cutting Up the Inner Shell of One of the "Brooklyn's" Gun Turrets. Several Pieces of Eight-Inch Armor Plate, Taken from This Turret, can be Seen under the Gun at the Left. The "Brooklyn" Was One of the Ships That Took Part in the Defeat of Admiral Cervera's Fleet off Santiago, Cuba, in the Spanish-American War, and has Long Been Obsolete Like the Other Ships of the Famous American Squadron, Many of Which have Served as Targets for the Guns of Newer Men-of-War

Another View of the "Minneapolis," Showing the Deck After the First Course of Steel Plating had been Removed for Part of the Distance around the Ship: This Illustrates the Effectiveness of the Gas Torches in Reducing the Heavy Armor Plate of Battleships to Salable Junk

pressure main was already in the yard, installed to feed its rivet-heating furnaces during the war, and this was simply coupled to the fuel side of the cutting-pipe system. The city-gas-oxygen flames cut up the entire protective deck of the "Minneapolis," built of three laminations of heat-treated steel, without a fragment being thrown, according to those in charge of the work.

Definite figures on the cost of demolishing these vessels have not been made public, but enough is known to warrant the statement that the steel and other ferrous materials removed nearly or quite repaid the investment and the cost of scrapping, leaving the proceeds of the brass and bronze scrap wholly or nearly clear profit, which result would likely be the same with larger ships.



Top: Showing How Inserts are Placed between the Leaves of the Spring and Pivoted on the Oiler. Bottom: Ordinary Leaf Springs Containing Steel Inserts and Oiler

AUTOMOBILE SPRINGS OILED IN EFFECTIVE MANNER

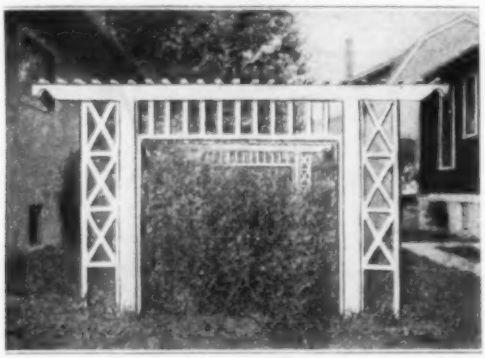
Lubricating the springs of a motor car can be accomplished in a rapid and efficient manner by the installation of a special oiler and steel inserts. These inserts are placed between the leaves of the spring and have ¼-inch slots cut through their centers, running lengthwise of each leaf to within 1 inch of the ends. When oil is forced, by means of a "pressure gun," down through the oiler, the lubricant passes out along the inserts, flowing in the slots until every portion of the leaf has been reached.

LIGHTWEIGHT CONCRETE HAS SLAG IN PLACE OF GRAVEL

Experiments conducted in France with concrete made with slag have proved that, other things being equal, slag concrete is rarely weaker, and generally a little stronger, than ordinary gravel concrete, and that its weight is from 30 to 40 per cent less. The ratio of strength to weight is at its maximum when the proportion of sand is from one-fourth to one-fifth that of the slag used as aggregate. In practical applications this reduction of dead weight is specially advantageous in such structures as arch and suspension bridges.

SWEET-PEA TRELLISES SERVE AS CLOTHESLINE POSTS

Wanting a bit of garden to brighten his home and finding it necessary to stretch a clothesline in the only place available, a resident of Fargo, N. D., built the necessary posts so as to serve at the same time as sweet-pea trellises. This he

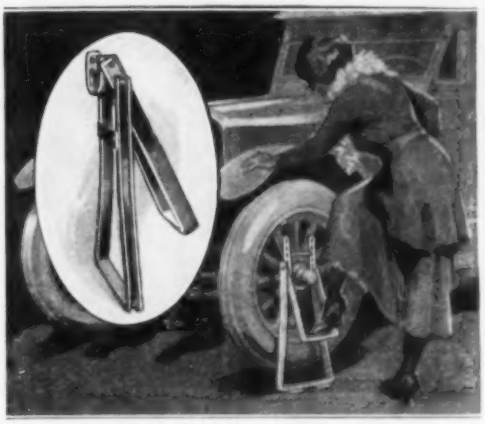


The Sweet-Pea Trellises Pictured Above were Built to Serve Also as Clothesline Poles

did by stretching wire netting between uprights of 6-by-6-inch timbers, using lighter lumber for the crosspieces and finishing the design with 2-inch lattice. This combination of the ornamental and useful makes a quite pleasing impression.

SUPPORTING JACKS FOR AUTOS ADD TO LIFE OF TIRES

It is well known that the life of auto tires is considerably lengthened if they are relieved from the weight of the car while standing on the damp and oily floor of the garage. This can be done readily by a simple lifting jack that is now on the market. It is made entirely of steel, and a set of four, one for each wheel, weighs only 25 pounds. In the

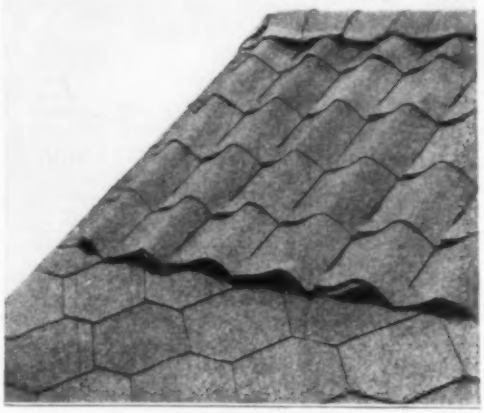


Steel Supporting Jack for Relieving Tires from the Weight of the Car: Inset Shows Enlarged View of the Jack, Which Is Adjustable for Any-Size Wheel

supporting frame is pivoted a lever, at one end of which is a sling that is placed under the wheel hub, which is then lifted by pressing on the other end of the lever with the hand or foot.

COMPOSITION SHINGLE SERVES AS TILE OR FLAT PATTERN

A western manufacturer is introducing a shingle made from prepared roofing, that can be used to represent a Spanish tile roof or laid flat according to a geometric design. The advantage lies with the dealer who can supply the demands for two kinds of roof from a single stock.



Roof Covered with New Composition Shingles, Which can be Laid Flat in a Geometric Pattern, or So as to Resemble Tile

RARE COPY OF BIBLE DONATED TO AMERICAN LIBRARY

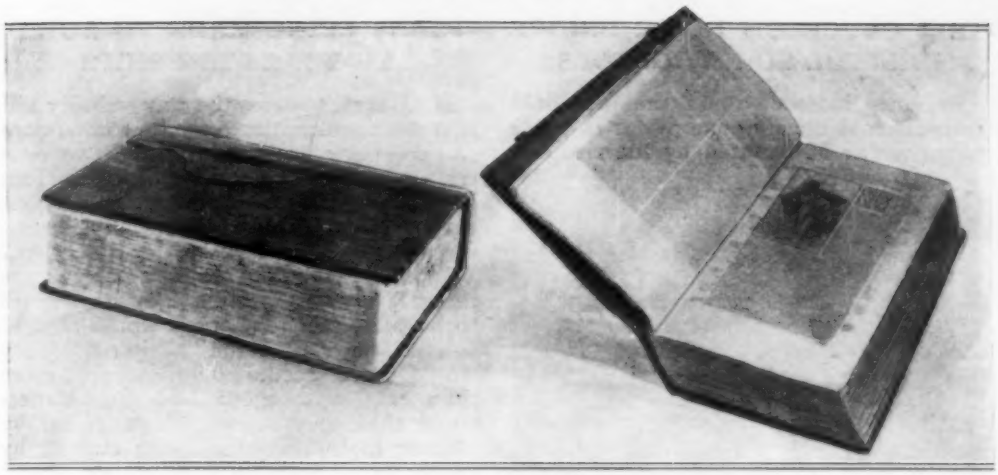
The only known copy of the first Protestant Bible printed in Latin has recently come into the possession of the

Title Page of Bible Recently Presented to Cambridge, Massachusetts, Public Library: Note Coat of Arms of City of Cologne

Public Library at Cambridge, Mass., the gift of an anonymous benefactor. It is valued at $100,000 by the library authorities, which seems reasonable in view of some book transactions. Henry E. Huntington, owner of one of the finest collections of rare books in the world outside the British Museum, once paid $50,000 for a copy of the Gutenberg Bible, of which 20 copies are known to be in existence. Book collectors value books according to their rarity, condition, some special feature such as an autographed copy, first edition, or some peculiarity for which the book may be notable. This Latin Bible, which was compiled by one John Rudelius, a noted scholar and graduate of the University of Frankfort, Germany, is not only a first edition, but it is in as perfect condition as a book of its age could well be. It was dedicated "to the Most Wise and Learned Fathers of the City of Frankfort, and to the Consuls and Senators Most Highly Esteemed and Always Highly to be Honored by Me, Their Student and Disciple." Another feature is the title page and summary of contents, this being one of the first books to be so provided.

The printing of this edition was done in 1527, at Cologne, by Peter Quentel, who shortly before had printed an edition of the New Testament for Tyndale. The text is in black letter, with numerous woodcuts by Anthony of Worms, some of which had been used in the Grenville edition of Tyndale's English New Testament, published in 1526. These woodcuts are excellent examples of wood-block engraving; four of them, used as initial pieces at the head of each page in the four Gospels, being of especial interest. The four Evangelists are here represented as follows: Mark with a lion; Luke with a bull; John with an eagle; and Matthew with an angel dipping his stylus in the inspiring sunlight. The volume is a sample of skillful printing and painstaking work in the letterpress, for it is as bold, black, and clear as work done by the printers of today. The binding is still strong, and the vel-

Page from Latin Bible, with Cut Representing the Evangelist St. John with the Apocalyptic Figure of an Eagle



This Bible, Valued at $100,000, Is the Only Copy of Its Edition Known to Exist. It is Shown Opened at the First Chapter of Genesis, the Figure Representing the Creation of the World

lum cover, though stained and yellow with age, is perfectly sound. The dog-eared condition of the margins, title page, and front pages, shows that it has been much handled and read, giving to it the appearance of the deckle edge, affected in many present-day books.

The size of the original edition is unknown, but editions were never large in those days, amounting at most to only a few hundred copies. Another edition of this Latin Bible, printed in 1528, has disappeared from view, and it is safe to assume there is no other copy in existence.

MAPPING VEGETATION WITH A PANTOGRAPH

The millions of acres of cattle and sheep ranges within our national forests, are under the management of the U. S. Forest Service, and one of its duties is to calculate the "carrying capacity" of each range; that is, the number of cattle that can be grazed on it without exhausting the range. For this purpose, intensive field studies are constantly being made in the western forests, many of which have already been completely covered by a thorough range survey.

One of the means by which the live-stock capacity of the range is found is the establishment of sample lots at regular intervals and in all different grass and weed-forage types. With the aid of a special pantograph, a detailed map is made of the area covered by the different kinds of vegetation on the plot. Two men operate the instrument. One manipulates the free-moving arm and with its pointer circles the base of each individual bunch of grass or weed stems. The areas thus circumscribed are reproduced on a small scale by a pencil on a map board, and the resulting sketch shows a series of irregular patches, which represent the area covered by the forage plants, as compared with the total ground area of the plot. Large numbers of these plots are thus mapped each year, and the total percentage of increase or decrease in vegetation, due to grazing, is calculated. These data and the known forage values of the grasses are then used to determine how many cattle or sheep can be run on the area without injury to the range.

PHOTO BY U. S. FOREST SERVICE

Pantograph and Quadrant in Use for Charting Vegetation on a Representative Plot, from Which the Forest Service Determines the Grazing Capacity of the Range

TIDE GAUGE ON RIVER BRIDGE HELPFUL TO NAVIGATORS

Recently installed upon the pier of a bridge across the Potomac River is a tide gauge which is operated by the rise and

Tide Gauge on a Bridge across the Potomac River Shows at Any Time the Number of Feet of Clearance between the River and the Bridge

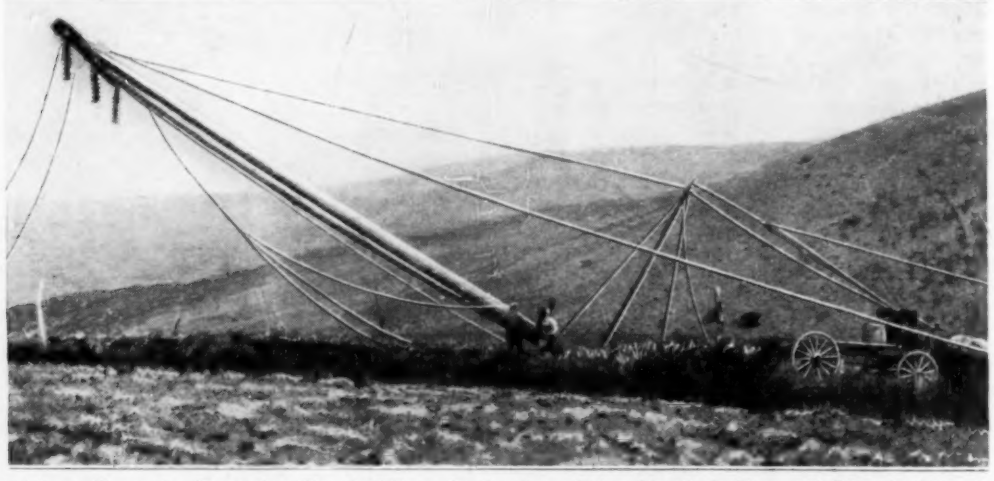
fall of the tide. On its dial a pointer, like the hand of a clock, indicates at any time the number of feet of clearance between the river surface and the bridge. This is of great assistance to tugboat captains, who can see at a glance whether it is possible for their boats to pass safely under the bridge or not.

PLANS BEING MADE TO BUILD TWO 70,000-TON SHIPS

If Congress passes the ship-subsidy bill, it is stated authoritatively that an American company proposes to build two electrically driven ships, each of 70,000 tons gross, for service in the Atlantic passenger trade. These ships would, therefore, surpass the largest ship afloat, the White Star liner "Majestic," by more than 13,000 gross tons. As they are planned to be 1,000 feet long, they would also be 44 feet longer than the "Majestic." They would have accommodations for more than 3,000 passengers, and it is understood that they are to be propelled by electric motors supplied with current by generators driven by turbines or Diesel engines. The company will be wholly American, and the work will be done in yards in this country. The company, it is said, would also buy some of the U. S. Shipping Board's largest ships.

POLES RAISED FROM GROUND COMPLETELY ASSEMBLED

Poles and towers for carrying the wires of the company that supplies electric light and power in Salt Lake City have the crossarms and insulators attached to them before they are raised from the ground. It is, of course, much easier to do this assembly work on the ground, and there is also the saving of the time expended in hoisting the materials to a workman after the pole is erected. It is just as easy to hoist the poles with the crossarms on as with them off.



Raising a Tower for Supporting Electric Wires, the Insulators Being Already in Place, and Thus Avoiding the Necessity of Hoisting and Installing Anything but the Wires Themselves After the Tower has been Erected

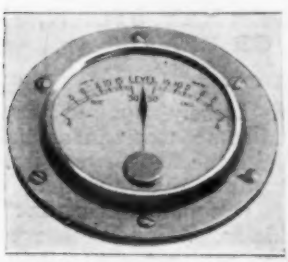
Corporal André Peugeot, the First French Victim of the World War: At the Spot Where He was Killed by German Uhlans, 30 Hours before the Official Declaration of War, the Monument Seen to the Right was Erected to His Memory and Recently Dedicated

MONUMENT TO FIRST FRENCH VICTIM OF THE LATE WAR

Corporal André Peugeot has been immortalized by having been the first French victim of the World War. He was killed by a band of Uhlans at Jonchery, near the fortified town of Belfort, just across the French frontier, on Aug. 2, 1914, 30 hours before the official declaration of war by Germany. At the spot where he met his fate, there was recently dedicated to his memory, with elaborate ceremony, a monument of stately proportions and impressive design.

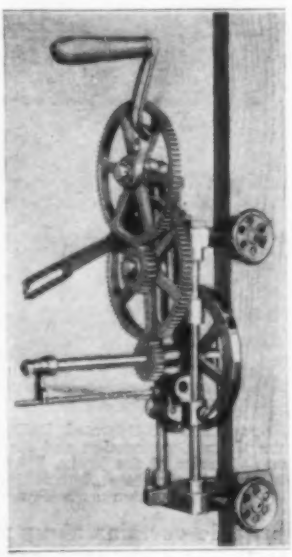
AUTOMOBILE GRADIENT METER MOUNTED ON THE DASH

Another new instrument for the automobile dash is a gradient meter, manufactured in England, that indicates on a dial the percentage of any incline up or down which the car may be traveling. The graduations for rise or fall are divided from 1 in 4 to 1 in 30, showing grades, therefore, from about 3 to 25 per cent. The pointer is operated by the action of a pendulumlike weight, which is immersed in oil in order to prevent it from being oscillated when the car is traveling over rough roads.



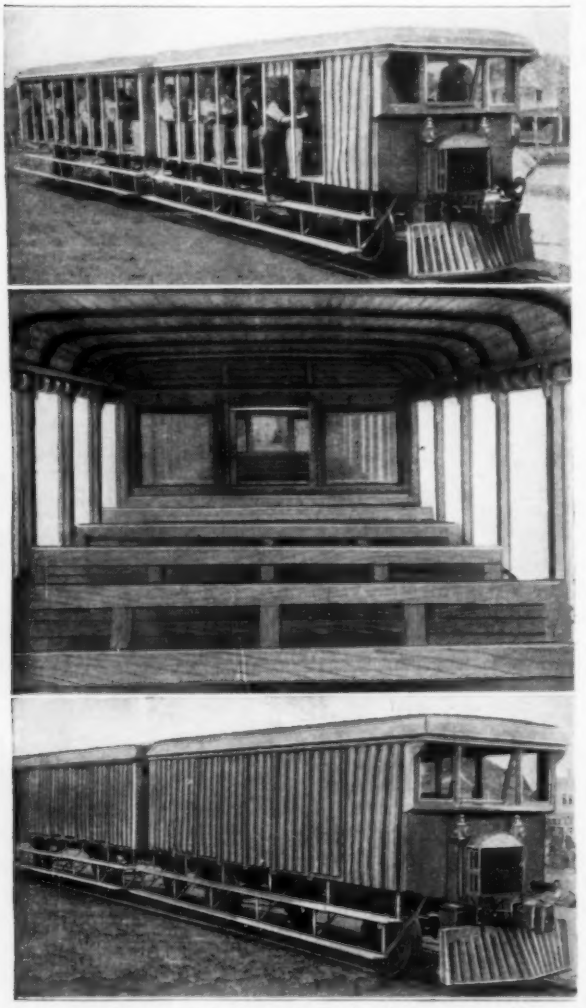
PORTABLE LOCK MORTISER USED ON DOOR JAMBS

To make unnecessary the common practice of cutting mortises for locks in door jambs by hand, a portable lock mortiser has been constructed that will do the work better and in far less time. It will cut any mortise of from ⅝ to 1⅜ inch in width, up to 4¾ inches in depth, and 6 inches in length. The machine is readily attachable to the door jamb by means of self-centering clamps, and the only adjustment necessary—that of regulating the length of the mortise—is done by simply sliding a small sleeve up or down a vertical rod.



GASOLINE RAILROAD TRAINS CUT OPERATING COSTS

Cutting the operating costs of short-line railroads or electric lines, and at the same time maintaining reliable transportation service, is possible with the use of equipment produced by a Wisconsin company. The innovation consists of a two-car unit of the open type, having adjustable curtains along the sides for protection against the weather. The forward car, which contains the gasoline engine, seats 35 persons, while that at the rear can accommodate 50 passengers. The outfit is equipped with air brakes, electric starter and horn, standard couplers, locomotive cowcatcher, rail-sanding apparatus, and a high-speed reverse gear, all of which make it a highly efficient train.



Top: Gasoline-Operated Railroad Train of Two Cars, Showing the Open Construction and Running Boards on the Sides. Center: Interior of the Train, Showing the Seating Arrangement and Adjustable Curtains Rolled Up. Bottom: Adjustable Curtains Pulled Down as a Protection against Bad Weather

UTILIZE WASTE TO INCREASE SUGAR YIELD OF BEETS

In line with the movement for greater efficiency and the reduction of waste, a Utah beet-sugar concern has followed four years of experimentation with the installation of equipment for recovering sugar from the molasses heretofore discarded by the plant. The molasses is chemically treated and filtered, after which it is subjected to an evaporation process, followed by boiling to the point of crystallization. In the later stages, the process and equipment are identical with those of a standard sugar-beet factory, and it is therefore possible to produce the additional sugar at a relatively small investment and with low operating costs. With a somewhat makeshift layout, 35 per cent of the waste molasses is recovered as sugar of good grade, and it is believed that as high as 50 per cent can be converted with a better plant. Aside from small quantities mixed with ensilage and some used as fertilizer, the molasses has been dumped into a near-by stream or spread over the ground to dry, so the new process will result in the saving of thousands of dollars to the sugar-beet industry. An added benefit is that the working season of the plants will practically be doubled, and the help employed longer.

WATERMELONS GROWN UNDER HAY, STRAW, OR CANVAS

Growing watermelons under cover of loosely applied hay, straw, and sometimes canvas, has produced in the Northwest irrigated regions, this summer, a superior fruit that is equal, it is claimed, to that of Texas fields. It is now believed that such covering, however slight, helps to keep in the ground warmth accumulated during the day, which, ordinarily, would be dissipated by the night air.

BOAT CLEARS RIVER CHANNEL AND ALSO BUILDS LEVEES

For clearing the channel of snags and obstructions and for building levees on either bank, a novel kind of dredge is used by U. S. engineers on the Ohio River, below Cincinnati. The boat—called the "Scioto"—is a modification of an ordinary dredge, the boom of the crane being used for hoisting snags from the river bed, and swinging them onto the banks, where they are suitably disposed of. At the stern is a long derrick that carries a pipe from the vessel to a rotating cutter at the end of the derrick. When in operation, the boat is anchored at any point where the channel has to be cleared, the cutter is lowered to the river bottom, and is driven by power from the vessel. This has the effect of cutting up the material sufficiently to allow it to be sucked through the pipe into a receptacle in the interior of the vessel. From this pipes extend laterally to the shore, which may be as long as 300 feet, and these pipes deliver the material suitably for disposing of it, if desired, in the form of a dike or levee. When this operation is completed at one point, the vessel is moved a distance of 4 feet, anchored, and the operation repeated. Thus the process continues for any required distance.

TELEPHONE-DIRECTORY HANGER SIMPLE AND CONVENIENT

Having the telephone book near the instrument is a great convenience, and a simple holder has been constructed which can be easily and quickly attached. The book is opened at the middle, the light polished-metal holder inserted, and the whole hung on a hook or nail by the ring at its end.

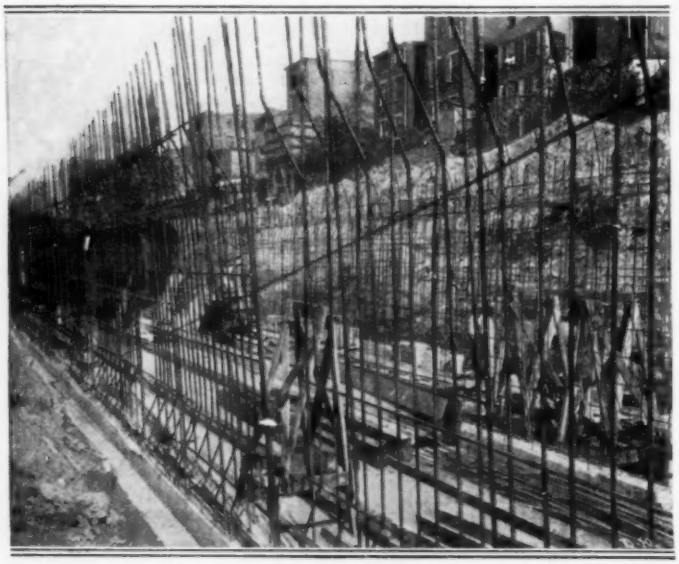
¶ Those wishing further information on anything described in the editorial pages can obtain it by addressing Bureau of Information, Popular Mechanics Magazine.

Dredge That Clears a River Channel and Builds Dikes or Levees on Shore: At Left and Above Are Two Views of the Derrick That Projects from the Stern of the Boat, and Has a Rotary Cutter at the End of It. At Right are Shown the Pipes That Connect the Vessel with the Shore

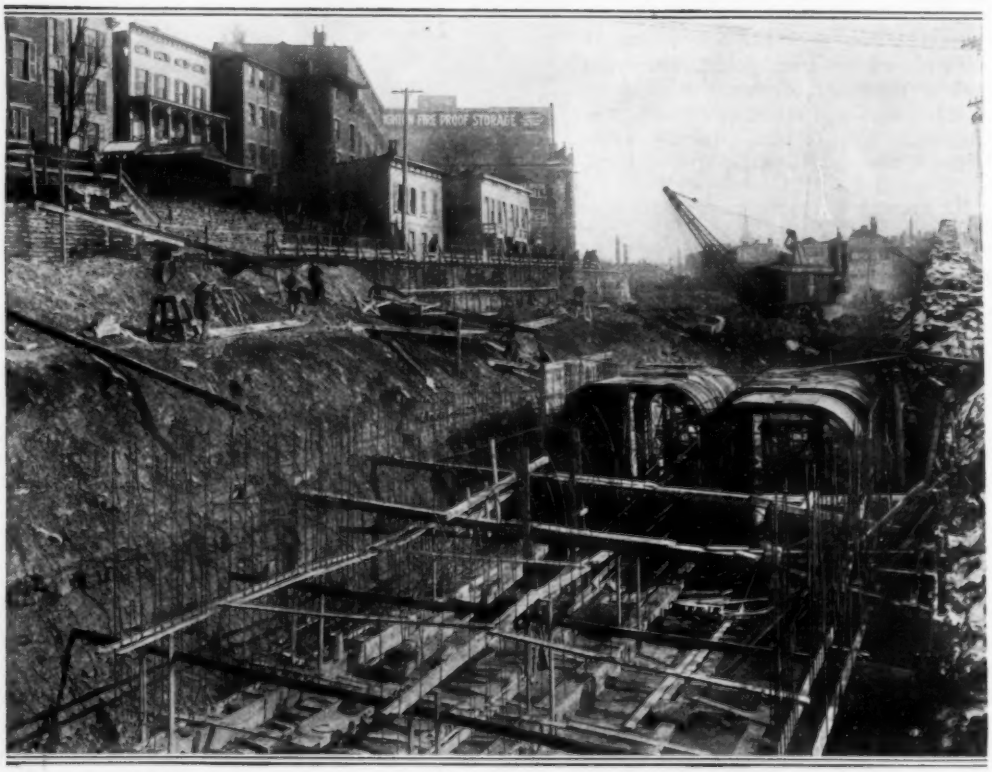
COMBINE SUBWAY, SURFACE, AND "L"-SYSTEMS

By GEORGE F. PAUL

THE city of Cincinnati is busy at the present time in trying to free itself from traffic congestion in the main parts of its business district. To handle the thousands of passengers that pour into this district every workday morning, and then late in the afternoon make a frantic scramble to reach their homes in the distant suburbs, a rapid-transit railway is being built.



It will be a combination subway, surface line, and elevated system, the plan being varied to suit the different conditions encountered. The system, when completed, will be a belt line, with all the latter's decided advantages. In 1916, the city voted $6,000,000 for this plan, when this sum was thought sufficient to build the entire system,



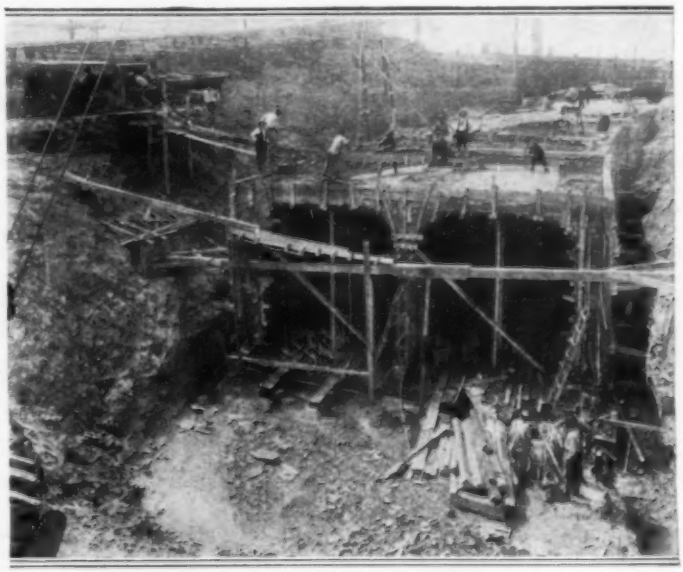
Above: Vertical Reinforcing Bars That Form Part of the Side Walls of the New Cincinnati Subway Tunnels. Below: Excavation for Subway, Showing Bottom Concrete in Place, and Side Wall, as Well as Some of the Arched Forms

View of One of Cincinnati's Subway Tunnels, Showing the Completed Concrete Work before Backfilling: Note the Small Track on the Roof of the Tunnel, Which Carried the Concrete Cars from the Mixer to the Forms

but with soaring labor and material costs, much more will be required to complete it. However, the work has been pushed in spite of many obstacles, and at present about two miles of subway has been completed, 4½ miles of open work is constructed, and the line will probably be operated at first from Oakley to Race and Canal streets.

In one respect at least those urging this combination line have been fortunate: They have been able to obtain from the State of Ohio the right of way for a considerable distance along the old bed of the Miami and Erie Canal. This has meant a great saving in excavation costs and has speeded up the work materially.

Whenever a Cincinnati business man who lives in the suburbs to the north of the river wants to reach the heart of the city, which is in the vicinity of Fountain Square, it is necessary for him to cross practically the whole city. To the east of Mill Creek, on a slight elevation, stands this business district. At a varying distance from the river rise the bluffs that are so common throughout the Ohio and Mississippi valleys. A rolling country stretches



Subway Tunnel under Construction, Showing How, in Many Places, the Concrete was Run through a Chute into the Forms, Direct from a Movable Mixer

away from the brow of the bluffs. The number of streets tapping the business district from these bluffs is strictly limited, and with street-car lines on practically all of them and the number of automobiles steadily increasing, traffic is so slowed down that the worker in the business district spends entirely too much of his time in getting to and from his work.

The belt line is intended to help handle the cars of the interurban lines. It is planned to run the interurban cars to the heart of the city over the new tracks until such a time as the other traffic makes this impossible. A combination interurban and loop station on Canal Street will prove one of the main points on the new system.

There are to be no grade crossings on this new line. This means that far greater speed will be possible and far greater safety will be assured. The line will be double-track, standard-gauge, with power from a third rail. With 4-car trains spaced 1 minute 9 seconds apart, it is estimated that more than 100,000 passengers can be handled an hour. Each car is to be 70 feet long. Reinforced-concrete construction has been used in building the double-tube structure for the subway portion. In order to admit freight cars, if necessary, the tubes have been built with a clearance of 14 feet 9 inches over the top of the rail. Reinforced concrete has also been chosen for building the elevated portion of the line. Block systems, ventilating openings, emergency exits, and other late safety appliances and measures, have been adopted to make it an up-to-date system.

NAIL-STRAIGHTENING DEVICE EASY TO OPERATE

For straightening badly bent nails or spikes rapidly and easily, a small, simple machine is in use in Germany. A vertical hand lever is pivoted to one end of a stand which has at the other end a slotted device, into which the bent nail can be dropped when a second small hand lever connected with it is raised. Hinged to the vertical hand lever is a rod that passes through this slotted portion of the stand, and has connected to it a lug that holds the head of the nail. In operation, the vertical hand lever is pressed forward, the nail is dropped in, and the second small lever is pressed down upon the nail. Then the vertical lever is swung back, drawing out the nail straightened.

Nail-Straightening Device Shown Above with a Bent Nail in Place Ready to be Straightened by Swinging Back the Vertical Lever, as Shown Below

TEXTILE INDUSTRY TRYING TO SPIN KAPOK FIBER

Kapok fiber, that buoyant material now used so extensively in the manufacture of mattresses, pillows, cushions, and life preservers, is being made the subject of exhaustive experiments by the textile industry. The object is to find a means whereby this peculiar substance can be spun into thread. So delicate is this fiber, which is short and brittle, that it is broken into tiny particles as light as dust, at the slightest tension. Nevertheless, the possibility of spinning this valuable product, which comes from South America and Java, is the goal toward which many manufacturers and laboratory workers the world over are expending ceaseless effort.

¶Posts, poles, and ties cut from blight-infected chestnut trees are as durable in service as similar timbers cut from healthy trees, according to the U. S. Forest Service, although it is advised that these timbers be cut as soon as possible from the trees infected with fungous decay.

ADOBE BUILDINGS LONG IN RUINS REMODELED

IT HAS become a popular practice with artistically inclined Californians to purchase the old ruined adobe buildings at Carmel and Monterey, and convert them into modern studios and residences. The remodeling is done so as to make them architecturally as attractive as possible, and in connection with some of them are historic associations that make them additionally interesting.

Specimens of such buildings are shown in the accompanying illustrations. At the top is a view of an adobe building at Carmel that had been in ruins for about 100 years, and was remodeled into a charming and strictly modern tea room.

Below this is an old adobe house at Monterey that was purchased by an artist, who converted it into a studio, framing into it the large window at the gable end, that gave him all the light necessary for his work.

Next below is a view of an old adobe building, at Monterey, in its unimproved condition, giving an idea of the work that has to be done in remodeling it, refloor-ing it, and installing it with plumbing.

Below this, taken from another point of view, is the same building after it was remodeled, showing the wonderful results possible with such unpromising material. The walls are about three feet thick, and the work that had to be done on them was far from easy.

PHOTOS COPYRIGHT, L. S. SLEVIN

RIVER MADE TO PURSUE PRESCRIBED COURSE

By J. B. HOLDCROFT

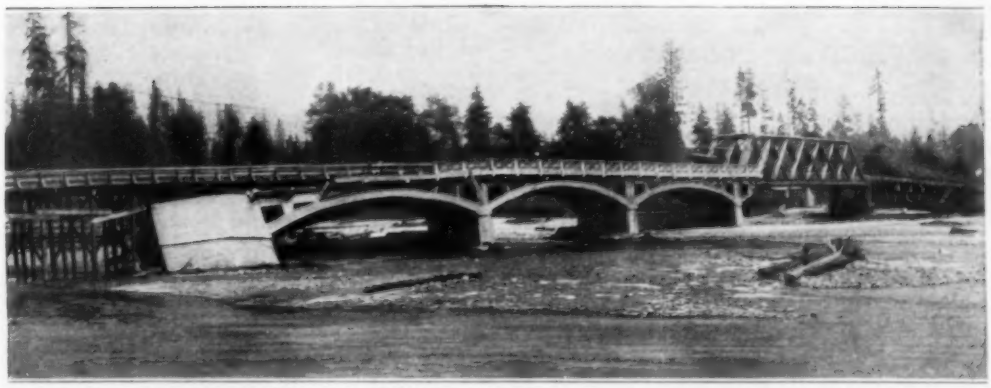
THE Capilano River near Vancouver, B. C., formerly had the habit of wandering over flats about a mile wide, for some distance near its mouth, flowing in one place one year and in another the next. The construction of a railroad bridge at this point made it necessary to reduce the width of the river bed from 900 feet and confine it to a channel barely 200 feet wide.

Wreck of Highway Bridge, above the Railway Bridge, Caused by the River during One of Its Flood Periods

Soon the river began wearing away the west bank, however, seeking a course it had undoubtedly followed before, which action was particularly destructive in periods of high water, and it became apparent that protective measures of an effective nature would have to be adopted. Previous attempts to put in abutments the current of the river could not move, had proved futile in the case of a highway bridge higher up. So, just above the bridge on the threatened bank, a simple little structure of logs and wire was extended 18 feet into the stream. This caused an eddy and checked the current enough so that entrained sand, stone, and floating débris were dropped out, and the formation of a bar begun on the river bottom. Then other jetties were similarly built at 400-foot intervals along the bank, and the growing bar extended to reinforce all of that section. Later, by adding a few feet to the length of each jetty, the bar was made wider and stronger, but this was no sooner accomplished than the river turned, and the fight had to be renewed on the opposite bank. Before it was stopped, the current

View of River during the Dry Season, Showing the Railway Bridge in the Background and One of the Jetties with the Sand Bar Which It Caused to Form in the River Bed

Railway Bridge with Two 100-Foot Openings Bottling Up the River Which Was Formerly Nearly a Mile Wide at Its Mouth



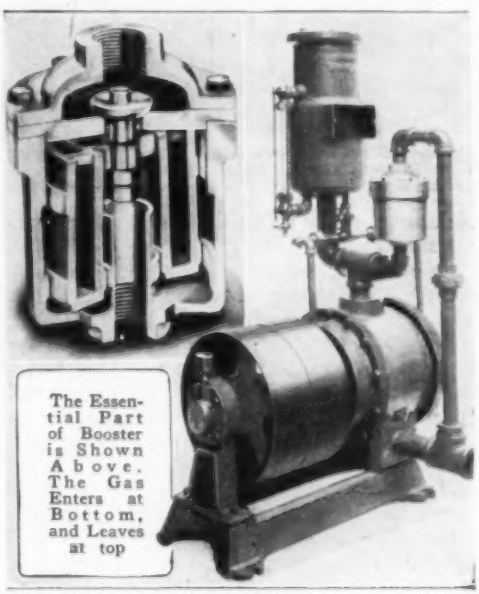
General View of Highway Bridge, Showing How the River Turned from One Side to the Other in Sweeping Out Both Approaches with Its Swift Current: Note Temporary Truss over the Most Easterly Span, and the Temporary Structure at Each Approach

had washed the rock filling from the wooden abutment pier, and later the central pier. This was stopped and the piers repaired by letting down into the water in front of them, woven-wire fencing covered with branches. Finally, to protect the east bank, a mattress of wire fencing and branches interwoven, was laid over it from the bridge for 900 feet upstream. Since this work was completed, no trouble has been experienced at the railroad bridge, but considerable damage has been done farther upstream, owing to the river changing its course several times.

ADVANTAGES OF NEW BOOSTER IN GAS-BURNING PLANTS

In plants using gas for heat treating, forging, and other work, the gas pressure, as delivered by the gas mains, will vary from time to time as the demand for gas is made, either in the plant itself or by outside influences, changing, thereby, the ratio of air and gas and causing a corresponding change in the combustion conditions. This causes waste of a great amount of gas. To overcome this waste, and in other ways improve the efficiency of the installation, a gas booster has been developed which assures a uniform volume and a nonpulsating gas pressure, and thus permits the proper adjustment of burners.

An excess of air supplied to the burners produces an oxidizing flame, which, in addition to wasting gas, causes scaling in heat treating and forging work, while insufficient air wastes gas by incomplete combustion. Neither of these conditions gives the maximum amount of heat for the amount of gas used. Experienced engineers have found that the best method of burning artificial gas is to increase or boost the pressure to about 7 pounds per square inch, and entrain the necessary air from the surrounding atmosphere at the point of application through an injector. This method, applied in the device here in question, relieves the operator of all adjustments of air and gas, and results in uniform heating and a constant combustion condition. It also eliminates air piping throughout the plant,



The Essential Part of Booster is Shown Above. The Gas Enters at Bottom, and Leaves at top

and moreover, as the gas is under pressure, a much greater volume can pass through existing lines than could be had with the low pressure supplied by the main.

SUBSTITUTE FOR SCARECROWS DEVISED BY SUMATRANS

Farmers on the North American Continent who spend considerable money gunning for crop-destroying birds, when scarecrows have failed to perform their

Substitute for Scarecrows in Sumatra: The Native on the Platform Strikes the Bamboo Poles, Setting in Motion Bells and Rattles That Scare Away Birds

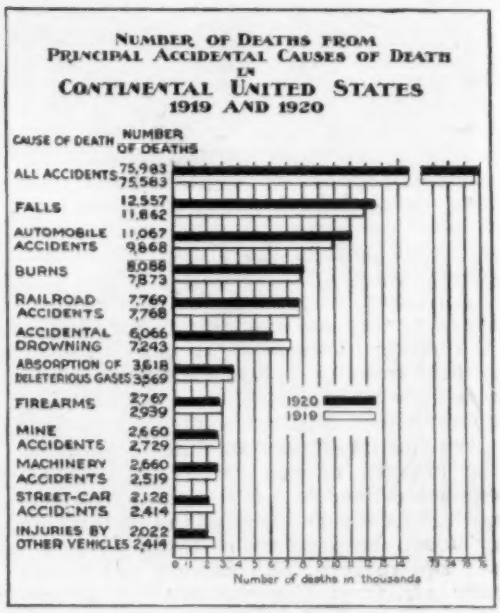
office, can get a valuable tip from the native farmers of Sumatra.

At the edge of the field to be protected, the farmer erects a strong high pole. At the top of this is built a small, well-braced platform, with a railing. To the railing are fastened two or more bamboo rods. From the rods strong cords are carried in all directions to upright flexible stakes, which are set around the boundaries of the field in such a way that an almost netlike stretch of lines covers the growing crop. To the cords, at short intervals, are attached grotesque paper representations of the spirit of the forest, previously placated with many offerings of fowls and pigs. In addition, though not intended in any way to imply doubt of the efficacy of the spirit, are hung little bells made of wood, which give off clicking sounds. At other places on the string are placed wooden rattles.

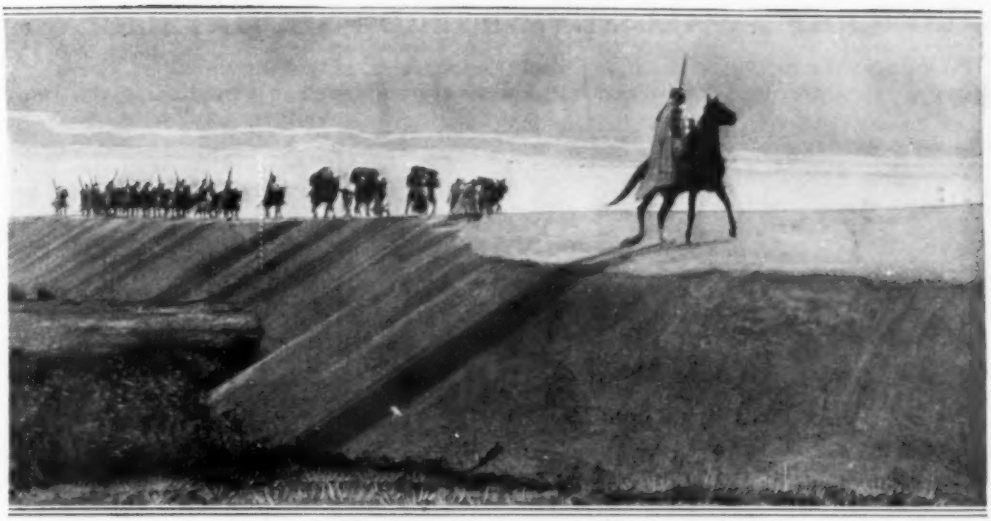
Just as the day is dawning, a member of the farmer's family, generally a small boy or girl, goes to the contrivance, climbs to the platform, and stays there till the last bird has disappeared at evening. During the daylight hours, the watcher is constantly on the alert, and whenever birds come near the field, the boy or girl strikes the bamboo poles, thus setting in motion the paper images, the wooden bells, and rattles, which latter are peculiarly discordant. The method never fails to protect the fields.

TOLL OF ACCIDENTAL DEATHS REACHES HIGH MARK

Seventy-six thousand persons died during 1920 from accidents which could have been avoided, according to statistics presented at the Eleventh Annual Safety Congress by the National Safety Council. Falling accidents of various kinds accounted for the largest percentage of deaths. Other causes in order of importance were: railroad accidents, drownings, deaths from gassing, firearms, mine accidents, machinery, street cars, other vehicles, and conflagrations. Twice as many men as women were killed, although the latter suffered greatly from domestic hazards. Children under 15 years of age figured in one-third of all automobile fatalities.


NUMBER OF DEATHS FROM PRINCIPAL ACCIDENTAL CAUSES OF DEATH IN CONTINENTAL UNITED STATES 1919 AND 1920
CAUSE OF DEATH
NUMBER OF DEATHS
ALL ACCIDENTS 75,983 75,583
FALLS 12,557 11,862
AUTOMOBILE ACCIDENTS 11,067 9,868
BURNS 8,088 7,873
RAILROAD ACCIDENTS 7,769 7,768
ACCIDENTAL DROWNING 6,066 7,243
ABSORPTION OF DELETERIOUS GASES 3,618 3,569
FIREARMS 2,767 2,939
MINE ACCIDENTS 2,660 2,729
MACHINERY ACCIDENTS 2,660 2,519
STREET-CAR ACCIDENTS 2,128 2,414
INJURIES BY OTHER VEHICLES 2,022 2,414
1920
1919
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14
13 14 15 16
Number of deaths in thousands

This Chart Presents a Comparison of the Number Killed in Accidents from Various Causes: The Black Lines Indicate the Toll of 1920, While 1919 is Represented by the White



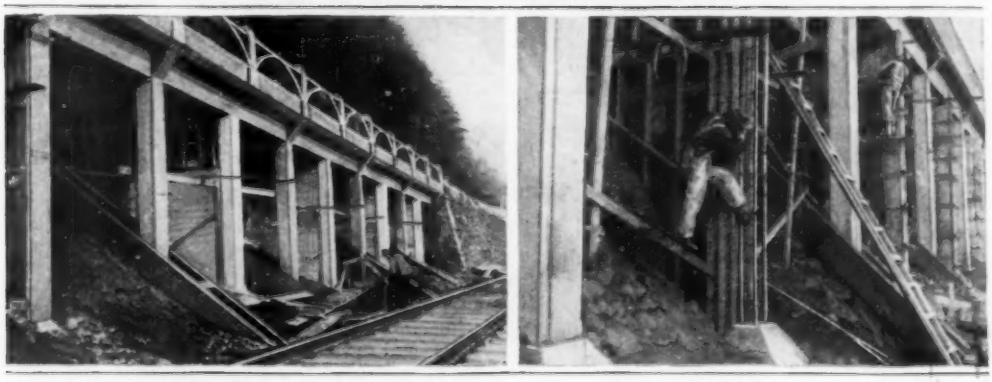
AMATEUR BEDOUINS ON THE WARPATH

WHAT appears to be a Bedouin sheik leading his band of desert rovers across the sands of an African waste, is only the members of a moving-picture producing company out on "location." The scene is from a spot less than 75 miles from Los Angeles, California, where the Mojave Desert with an approximate area of 25,000 square miles, affords the necessary environment and atmosphere for the filming of photoplays, the scenes of which are laid in Egypt, Arabia, or other lands of northern Africa.

CONCRETE PIERS REPLACED BY UNUSUAL METHOD

An unusual method was employed in the replacement of concrete piers under a viaduct on the Columbia River highway near Portland, Ore., which had been damaged the preceding winter by heavy drifts of snow. The customary wooden forms were built

beneath the viaduct floor, holes cut in this, and the concrete poured down into the forms from the roadway above. In addition to replacing the old supports, new piers to the same number were added, to prevent a possible recurrence of the trouble.



Top: Concrete Mixer, on the Viaduct, from Which Workmen are Taking the Mixture in Wheelbarrows to the Forms. Lower Left: Underside View, Showing the New Piers. Lower Right: Workmen Building Wooden Forms in Which the Concrete for the Additional Piers was Poured

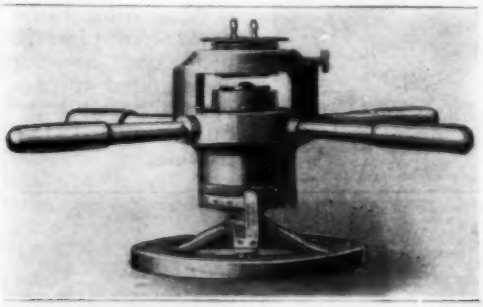
CONCRETE WALLS DESTROYED PNEUMATICALLY

Pneumatic hammers, used by street railway, telephone, telegraph, and other companies as paving breakers, were recently employed in demolishing the reinforced-concrete walls of a vault in a factory in Cleveland, Ohio. The work was expedited by having two men handle each breaker, and in this manner a 24-inch wall, 20 by 23 feet in area, was completely demolished, reinforcing rods and all, in three days. The concrete was broken up into pieces small enough for one man to handle easily, and for the reinforcing rods a cutting tool was used in the pneumatic hammers. The side walls of the vault were 12 inches thick, 10 feet high, and 51 feet long. Only 7 days were required to remove them completely, and the work was done more cheaply than by hand methods.

Part of a Reinforced-Concrete Wall being Destroyed by Pneumatic Hammers, Each Operated by Two Men to Make the Work Speedy: The Reinforcing Rods Still Standing were Broken Up Later with Cutting Tools

IMPROVED TESTER TELLS WORKABILITY OF METAL

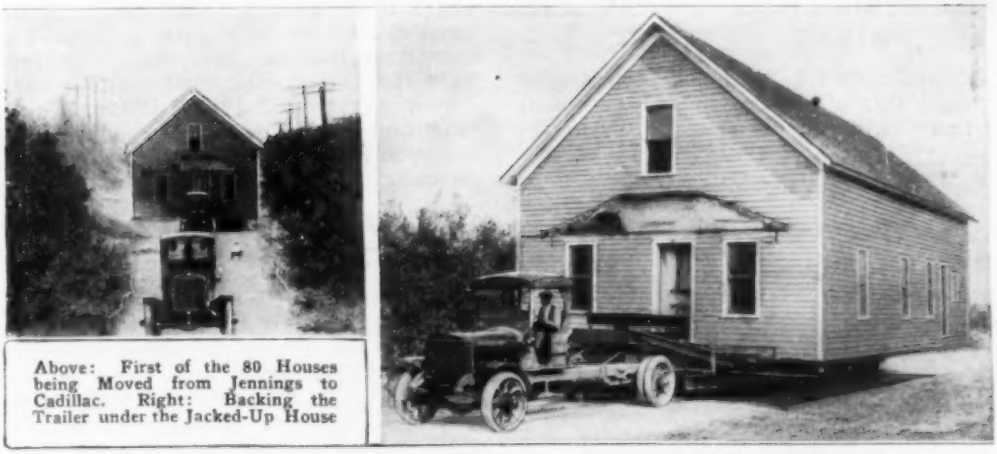
A machine has just been developed that will determine by actual test the drawing, stamping, folding, and compressive qualities of sheet metal. The machine is of rugged design and intended for use in the shop as well as the laboratory. By means of a special die and holder it is possible to test wire or rods of any material, up to No. 4 wire gauge. The machine combines with the regular indentation ball and micrometer screw, a micrometer thickness indicator which shows the thickness of the sheet or wire under test. A tester of this kind will save many dollars by eliminating improper material before much money has been spent in fabrication.



This Machine Determines by Test the Drawing, Stamping, Folding, and Compressive Qualities of Sheet Metal and Wire

¶Utilization of the Humber River, Newfoundland, in the production of electric power can be done so economically that it is estimated 186,500 kilowatts can be obtained as the result of an expenditure of only about $97 per kilowatt.

Specimens of Metal Tested by New Machine Which Indicates by Depth and Roughness of Dome, and Character of Fracture, the Workability of the Metal



Above: First of the 80 Houses being Moved from Jennings to Cadillac. Right: Backing the Trailer under the Jacked-Up House

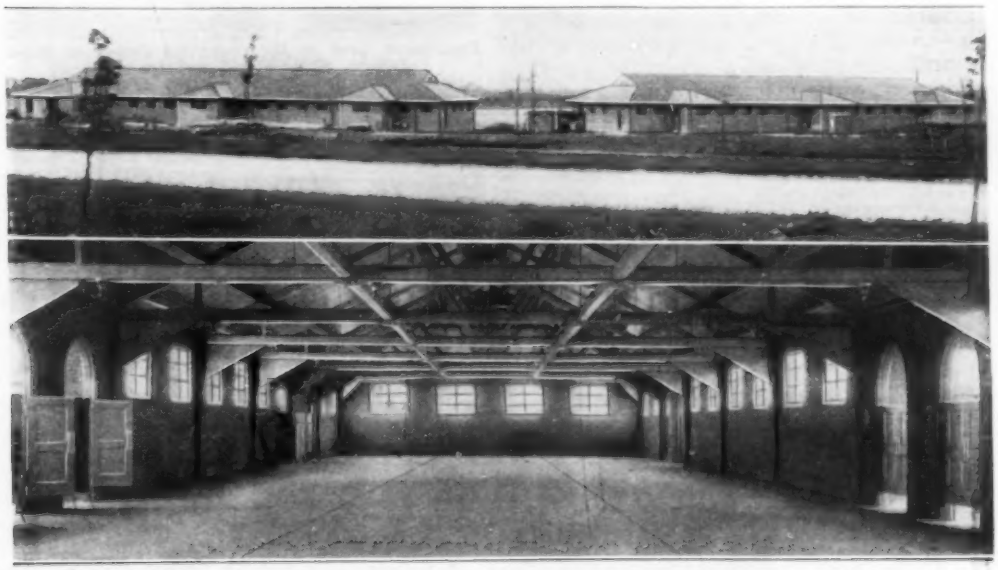
HEAVY MOTOR-TRUCK TRAILER MOVES 80 HOUSES 11 MILES

Some 80 frame houses that formed the little village of Jennings, in Michigan, are being moved to Cadillac, 11 miles away. A large trailer for use with a powerful 6-ton motor truck has been specially built for the purpose. The trailer, constructed with a heavy steel frame, has a capacity of 40 tons. The plaster was removed from the first house to lighten the load, but the truck and trailer handled it so easily that this was not considered necessary with the other houses. The transportation is taking place at the rate of several houses a week.

PHILADELPHIA'S PUBLIC BEACH IS LARGEST IN COUNTRY

Just completed and thrown open to the public, Philadelphia's municipal bathing beach is reported to be the largest in this country. The two bathhouses, located on an artificial lake in League Island Park, have a combined capacity of 6,000. Provision for 3,500 is made in the men's bathhouse, while 2,500 can be taken care of in the women's quarters.

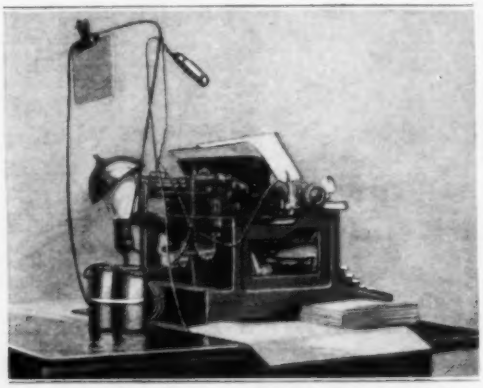
Both houses are equipped with steel lockers, special care being taken in the women's building to group the lockers so as to assure privacy. The dimensions of each building are 51 by 222 feet.



The Two Bathhouses, Pictured Above, were Recently Opened by the City of Philadelphia. They can Accommodate 6,000 Persons. Below is Shown the Interior of the Men's Quarters before the Installation of Lockers

ELECTRIC LIGHT ON MACHINE AIDS DEAF TYPIST

Handicapped by deafness, a typist overcomes this affliction to a great extent, when writing on his machine, by having



Typewriter of a Deaf Man Which Includes a Small Electric Lamp So Wired That It Lights When the End of a Line is Reached

installed on it an electric light in addition to the usual tabulator bell. Current is obtained from flashlight batteries, which are so wired that when the typewriter carriage reaches the tabulator stop, contact is made, and a red lamp suspended in front of the writer is illuminated.

PROVING-GROUND FIRE CAR HAS COMPLETE OUTFIT

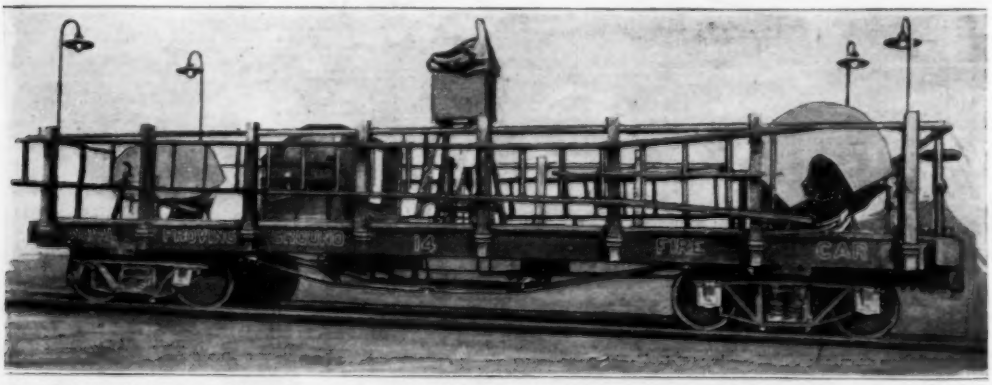
Protection against the fire hazard at the Indian Head, Md., naval proving grounds, is adequately furnished by the equipment of an efficient fire car. An ordinary railroad flat car is used, this being towed over the network of tracks, with which the hundreds of buildings are interconnected, by an electric trolley. The equipment includes hose reels, a searchlight and four electric lights—one at each corner of the car for night illumination—extension ladders, and a large tool box containing nozzles, axes, rope, and other miscellaneous fire-fighting aids.

IMPROVED INSTRUMENT EASILY TESTS PAPER FINISH

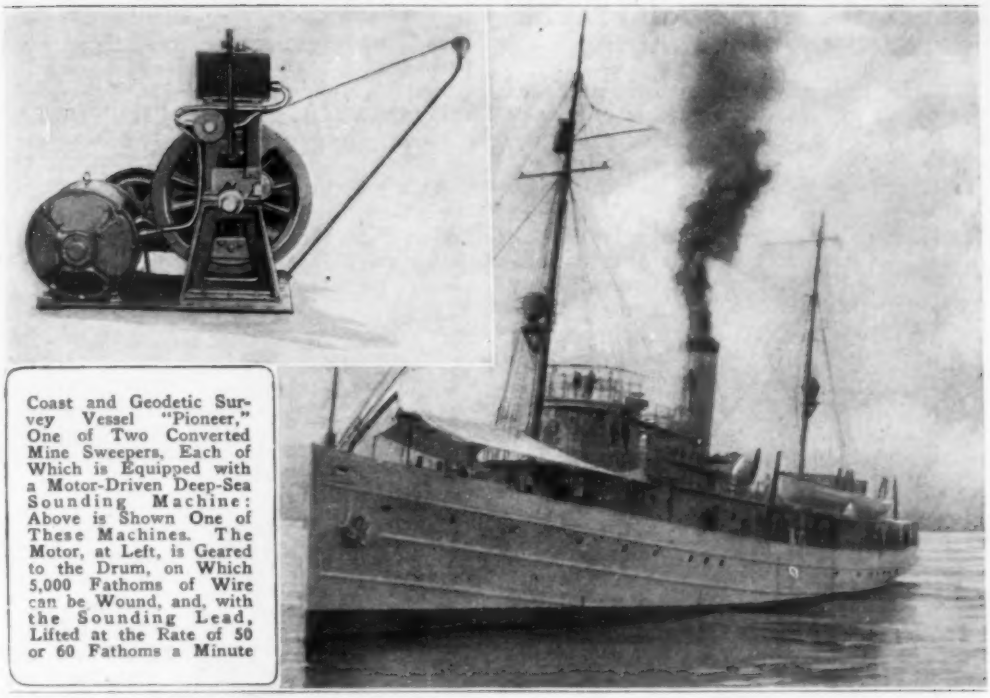
Refinements in design have lately been accomplished in connection with an instrument for testing the finish on paper that enable this work to be done quickly and accurately by a comparatively inexperienced operator. As in the older instrument, it depends upon the principle that obliquely reflected light is polarized much the same as from a glass surface, but the sensibility and accuracy have been considerably increased. Aside from its use in the paper industry, it can be

Instrument Used to Determine the Finish on Paper, Furniture, Automobiles, and the Like, by Analyzing the Reflected Light

applied to measuring the finish on furniture, automobiles, and the like.



Fire-Fighting Equipment Mounted on a Railroad Flat Car at a Government Proving Ground, Showing the Large Electric Lamps and Hose Reels at Each End, While the Tool Box and Searchlight are Seen in the Center



Coast and Geodetic Survey Vessel "Pioneer," One of Two Converted Mine Sweepers, Each of Which is Equipped with a Motor-Driven Deep-Sea Sounding Machine: Above is Shown One of These Machines. The Motor, at Left, is Geared to the Drum, on Which 5,000 Fathoms of Wire can be Wound, and, with the Sounding Lead, Lifted at the Rate of 50 or 60 Fathoms a Minute

DEEP-SEA SOUNDING MACHINE THAT IS MOTOR-DRIVEN

In connection with the Coast and Geodetic Survey, the two newest vessels, the converted mine sweepers, renamed "Pioneer" and "Discoverer," have been equipped with a motor-driven deep-sea sounding machine in place of the customary steam-driven apparatus of this kind. A 2-horsepower electric motor is used to drive the drum, upon which 5,000 fathoms of fine steel wire can be wound. A 50-pound sounding lead is used, and with 1,000 fathoms of wire out, this weight can be raised at the rate of 50 or 60 fathoms a minute. The advantages claimed for the machine are simplicity and the ease with which it is operated.

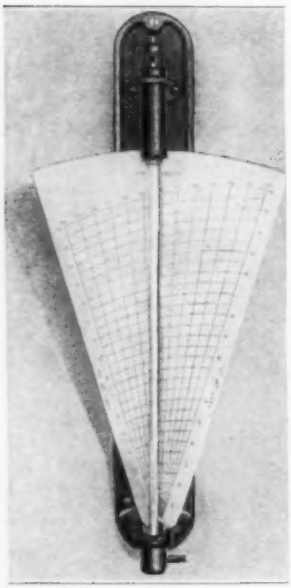
ONE HUNDRED FEET OF FILM FINISHED AT SAME TIME

The developing, rinsing, fixing, and washing operations necessary in photography, have been facilitated by the introduction of a new film holder. This appliance consists of four racks placed on top of each other and held in position by a rod passing through their centers. The racks have evenly spaced bars, mounted vertically and extending diagonally across them from one corner to the other. The films are wound around the bars with the sensitized side away from the metal, thus preventing any effacement of the coated part. Perforations in the racks permit the liquid being used to flow freely so that it will reach every part of the film, of which 25 feet may be wound on each set of bars.

Top: Four Racks Wound with Film and Ready to be Placed in the Developing or Other Solutions. Bottom: Four Bare Racks, Showing the Spacing of the Bars, the Perforations in the Bases, and the Long Center-Rod Support

LEVEL INDICATOR ADAPTABLE FOR VARIOUS LIQUIDS

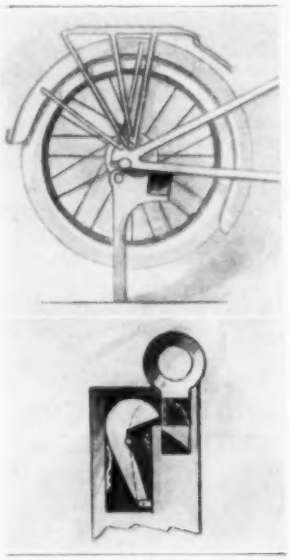
In the type of gauge which indicates the depth of a fluid contained in a tank by means of a counterbalancing column of mercury, an improvement has been made which permits the use of the same gauge in connection with liquids of various specific gravities.



The improvement consists of a chart attached to the gauge, which has upon it a number of scales, marked at the top with certain specific gravities, and along their length graduated in feet. For use, the proper scale, according to the specific gravity of the fluid, is lined up with the gauge glass, and the height of the mercury column will then indicate the depth of the fluid in the tank, in feet, or, with the tank area known, the quantity in cubic feet. Provision is also made for the attachment of an electric minimum and maximum-depth alarm. A check valve, located at the top of the instrument, serves to prevent the mercury from being blown out of the gauge glass, in case the instrument should, for some reason or other, be subjected to an overpressure.

MOTORCYCLE LOCK CONNECTED TO ITS SUPPORTING STAND

As a safeguard against theft, a motorcycle lock that is automatic in its action makes it impossible to move the machine under its own power or even to tow it away. The lock forms part of a supporting stand that can be attached to any motorcycle. It contains a pivoted locking bolt, which, when the motorcycle is raised on its stand, automatically snaps into locking position and cannot be released without the use of a key. To make it possible to raise the supporting stand from below the wheel, the key is inserted and turned, moving the locking bolt out of engagement.

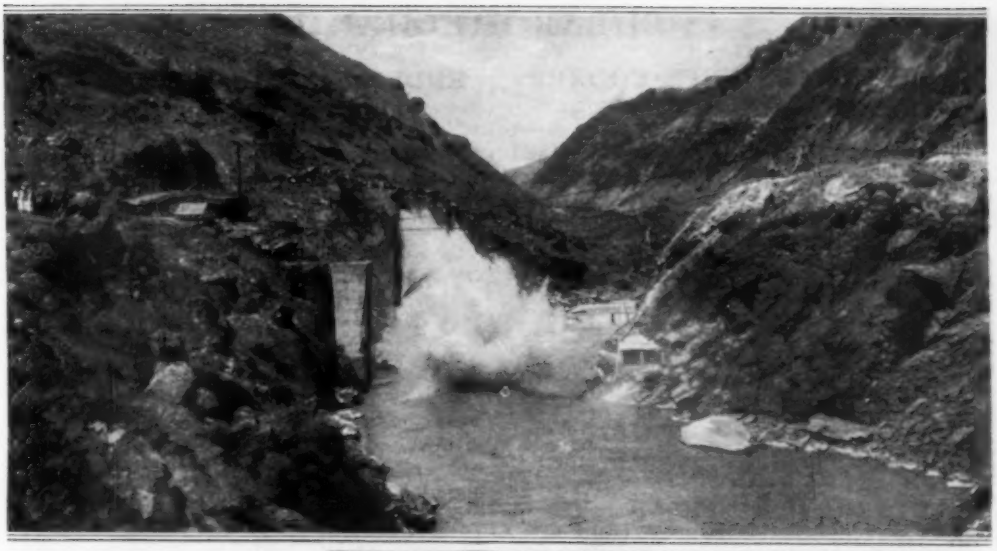


¶A huge airplane fitted with essential office equipment and a radiotelephone room, is being built for a wealthy Londoner, who will conduct business while traveling twice as fast as an express train.

NOVEL MANNER OF BUILDING AN IRRIGATION DAM

By O. JOHNSON

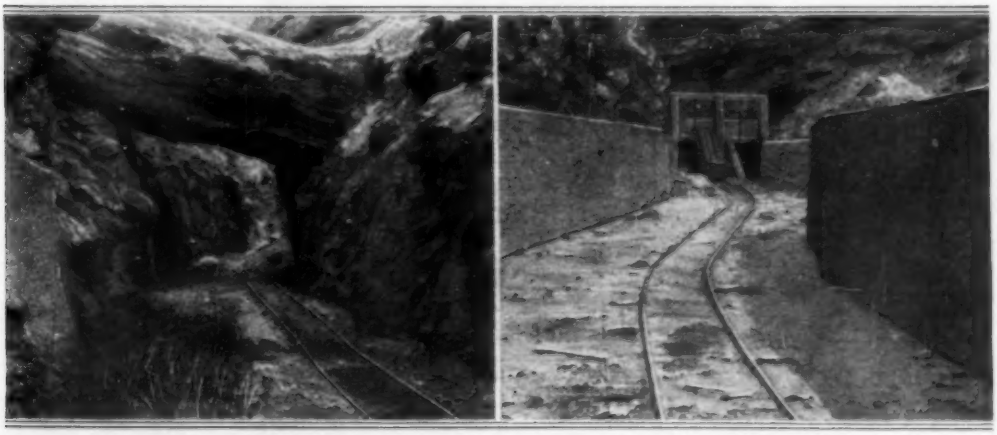
FOR the irrigation of 400 acres of arable land in the valley of the mountainous region near the town of Cromwell, in the province of Otaga, New Zealand, the Kawarau River has been dammed in a very novel manner. The river, at the spot where the dam was to be built, is very narrow and rapid, with steep rocky banks. It was not possible to build the dam in the usual way, and instead two large columns of reinforced concrete, one on either side of the river, were built. One was 16 feet square and 46 feet high, and the other 13 feet square and 36 feet high. At the base, these columns were notched out in the way an axman cuts the trunk of a tree in felling it in a certain direction. Charges of dynamite were exploded under them, one after the other, and they fell end to end across the stream. Behind them a backing of stone hewn from the rock banks was built up, and mixed with concrete, until the level of the water was raised above the intake of a raceway, cut out of the solid rock and in places lined with



One of the Columns is Seen Here Just as It Falls into the River, being Broken at the Notched Point by a Charge of Dynamite. The Standing Column Shows Where the Notch was Cut

concrete walls. This raceway is three-fourths of a mile long, and will carry the water to a point from which the whole of the flat can be irrigated by gravity flow. The floodgates and spillways in connection with this part of the work are completed, and there is now being built a power house containing turbines that will generate 700 horsepower for driving centrifugal pumps.

View of the Part of the Raceway Where It Enters the Power House, the Top of Which is Seen in the Immediate Foreground



Left: View Showing the Rough and Rocky Nature of the Country, Which Presented Many Dangers in the Way of Rock Slides. The Huge Stone Lying across the Cutting is Provided at One End with a Concrete Support. Right: Inside View of the Raceway near the Intake, Showing the Gates

AUTO EXHAUST-PIPE COOKER HAS THREE LARGE PANS

Three large pans, allowing a diversified menu for a good-sized party of tourists, are contained in a new auto-cooker which is heated by the exhaust. The cooker is made especially for a popular lightweight car, and is clamped in place under the hood. It is not necessary to heat either the food or any kind of radiator first.

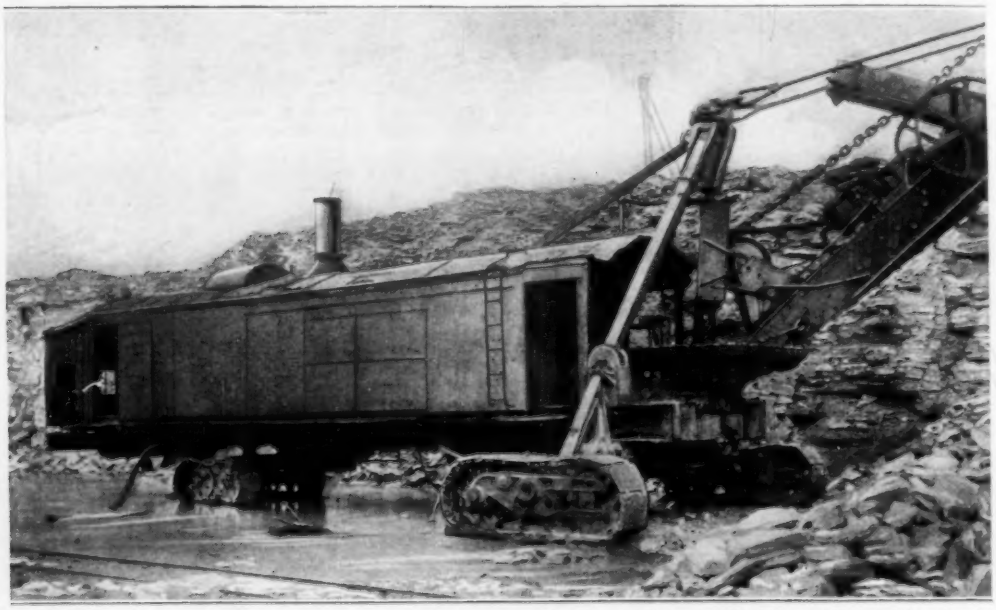
In the Illustration Above, the Cooker, Which is Heated by the Exhaust Pipe, is Shown Disassembled. Notice the Large Size of the Pans. On the Right, the Cooker is Shown in Its Regular Position Just under the Radiator Cover

ENDLESS-TREAD TRACTION RIG FOR STANDARD SHOVELS

Heavy excavating machinery, mounted on endless treads instead of wheels, has demonstrated its superiority to such an extent that a keenly felt want is met by the recent production of traction attachments of this type to replace the trucks and wheels of the older machines. In this way owners of shovels, still serviceable from other viewpoints, can realize the advantages of the newer equipment at a relatively slight expense.

Propelling can be accomplished by either endless tread or both working together, either forward or backward, at a speed of about 1½ miles per hour, and is sufficient to enable the shovel to climb a 15 to 20-per-cent grade.

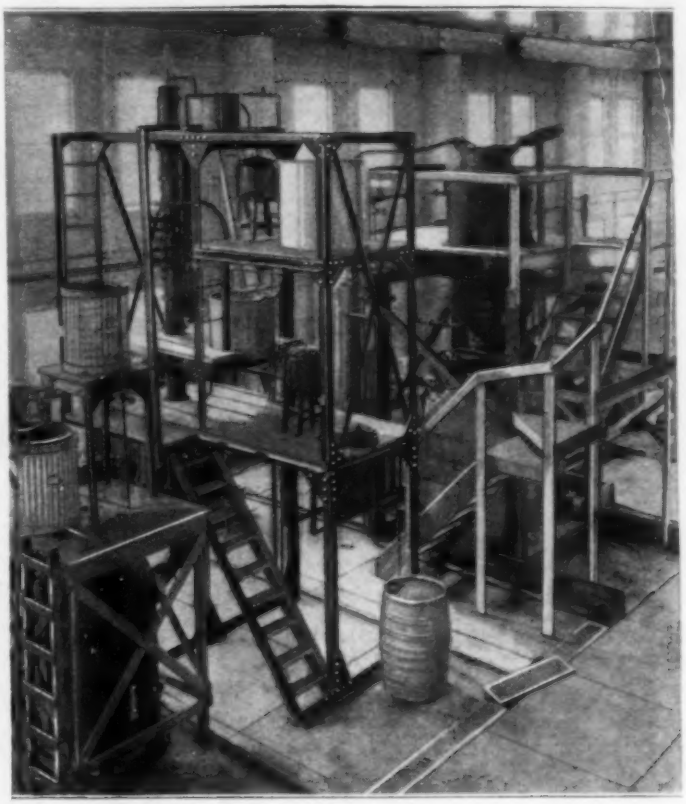
The recognized advantages of this type of traction are, that the operating field of the shovel is not confined to rails, which have to be laid, taken up, and relaid many times, and always give trouble in wet and cold weather; that it can be turned and does not have to face the blasting; that there are no supporting jacks to release and set, and no delays in operation from this source, and that the shovel is always in position to work most effectively. Furthermore, in an emergency such as a slide, the shovel can move itself out of danger, and there is no need of blocking under rails when working in soft ground.



Heavy Steam Shovel in Which the Standard Trucks and Wheels for Rail Service have been Replaced with Endless-Tread Traction Attachments, at Relatively Small Cost

CORNCOB SEEN AS SOURCE OF NEW INDUSTRY

Six years of persistent research at the Bureau of Chemistry of the Department of Agriculture, has resulted in establishing the fact that a number of interesting and useful by-products can be derived from the humble corncob. Chief among these is a colorless oily liquid called furfural. One of its attractive possibilities is as a fuel for automobile engines and similar motors, where experiments indicate it can be used by the addition of a more volatile liquid, without modification of engine or carburetor design. This work has shown that another use of furfural would be as a cheap and satisfactory substitute for formaldehyde, as used in combination with carbolic acid in making a synthetic compound which is used for the manufacture of phonograph records, varnishes, pipe stems, parts for electrical appliances, buttons, and the like. Other valuable by-products from the corncob are adhesives, and a cob pulp which is suitable as a substitute for wood flour in the manufacture of dynamite, or as a fiber in the manufacture of paper pulp and artificial silk.

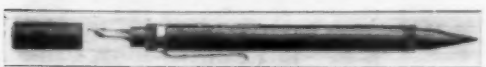


Stills and Condensers of the Development Unit Used by the Bureau of Chemistry, Department of Agriculture, in the Extraction of By-Products from Corncobs

The equipment used and the methods of processing to obtain the fundamental derivatives are relatively simple. The corncobs are placed in a closed container and cooked for two hours in the presence of steam at about 135 pounds' pressure. The resulting liquid is then freed from the pulp and distilled, so that, in condensing, the furfural is separated from the water. Following small-scale production by the government development unit at Arlington, Va., the department has made a survey of the regions where corn is extensively grown, to ascertain where factories could be located to support a production involving 100 tons of cobs per day, within a radius where transportation charges to the plant would be reasonable.

COMBINATION FOUNTAIN PEN AND REFILLABLE PENCIL

A self-filling fountain pen and refillable lead pencil, having all the good qualities of both, have been combined in one article. The barrel of the pen has the ink capacity of an ordinary fountain pen of the same size and is filled in a similar manner, while the pencil part contains a reservoir of seven standard-size leads.



Combination Fountain Pen and Refillable Pencil, with Removable Cap Which Fits on Either End

¶When you want anything and do not know where to get it, write Bureau of Information, Popular Mechanics, Chicago.

CIVIC FEATURES THAT PROMOTE THE COMFORT

A Beautiful Rosebush Climbs the Foliage of This Tree in Santa Rosa, California. Running Nearly to the Top, More than 20 Feet above the House, the Bush is Said to Be One of the Tallest Known

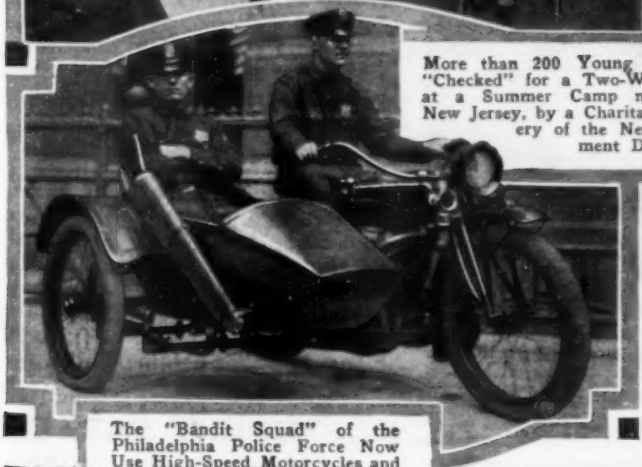
Magazines Formerly Thrown Away by Departing Hotel Guests are Now Collected by a Society of Women in Portland, Oregon, and Distributed to Poor Families

In the Public Parks of Fargo, North Dakota, City-Library Magazines are Placed for Reference in Specially Made Boxes Nailed to the Trees

This Large Sign near Olympia, Washington, is Strung between Two Telegraph Poles above the Highway, Close to a Dangerous Crossing. It is Strongly Illuminated at Night

AND ENJOYMENT OF VISITORS AND RESIDENTS

More than 200 Young Children were "Checked" for a Two-Weeks' Vacation at a Summer Camp near Oakhurst, New Jersey, by a Charitable Day Nursery of the New York Tenement District



The "Bandit Squad" of the Philadelphia Police Force Now Use High-Speed Motorcycles and Sidecars, and Carry Repeating Guns

This Revolving Cross on the Steeple of a Church of Wilkinsburg, Pennsylvania, Emits Flashes That Are Visible for Miles

After a Fence Skirting This Stretch of Road in California had been Repeatedly Broken by Careless Driving, It was Replaced by a Series of Posts 50 Feet Apart. At Street Intersections, the Posts were Set Up Close Together

METHOD TO PROTECT ROOTS OF IMPERILED TREE

BY COURTESY OF THE AMERICAN FORESTRY ASSOCIATION

Earth-Filled Channels were Formed to Protect the Roots of This Tree Where They Crossed the Excavation for the Foundation

When recent road-improvement work in New York City threatened the life of a beautiful large elm tree, special methods were adopted to protect the tree without interfering with the road work. Where the great roots crossed the excavation for the foundations of the new retaining wall, the earth was carefully scraped away from them, and they were wrapped in jackets of straw to preserve their moisture. Wooden sheeting was then driven vertically on each side of the roots to be protected. The channels formed between the rows of sheeting were filled with earth, and the concrete for the foundations was poured in the remaining spaces. Old steel rails, set on piers, were placed over the roots to protect them from excessive pressure.

¶A native Paraguayan herb named "ka-a he-e," possesses sweetening properties that are said to be from 150 to 200 times greater than those of sugar cane, in addition to which the herb is soluble in water and does not ferment, these merits obviously being of value commercially.

BAND WITHOUT INSTRUMENTS IN STUDENT PARADE

Mystifying the onlookers, a recent student parade at the University of Wisconsin, at Madison, furnished excellent band music in spite of a "conspicuous absence" of any instruments. The answer to the puzzling phenomenon was radio. The drum major carried, instead of the usual baton, a pole with antenna wires which extended over the heads of the marchers to a similar pole borne at the rear. The receiving set and batteries were placed on a litter and carried along under the antenna by several students, with two amplifiers, or loud-speaking horns, completing the outfit, which certainly presented an unusual appearance.

Parading Band without Instruments, Showing the Batteries and Receiving Set on the Litter, the Amplifying Horns, and the Portable Antenna

RAT-EXTERMINATION PROBLEM TURNED INTO SPORT

Rat extermination, periodically made the object of nation-wide campaigns, has recently been presented in a light which tends to give these activities a sporting aspect. The innovation originated in St. Joseph, Mo., where a number of dog fanciers arranged a contest to determine the respective speed and rat-catching ability of their fox terriers. The method employed was to build a semicircular inclosure of wire netting, 25 feet in diameter, 4 feet in height, and with a 10-foot opening at one side. Leading away from this opening was a runway, or race track, for the dogs, about 500 feet in length, at the end of which the eager animals were held in leash. Over the center of the inclosure, a rat was suspended in a cage which could be opened by pulling on a string. At a given signal, the rat was dropped to the ground, and simultaneously the fox terriers were released, the latter immediately making a dash for the luckless rodent. Three heats were run to each race, the first dog crossing the line at the entrance of the inclosure receiving a credit of six points; the second dog, four; third dog, two, and the one catching the rat, two. Great sport for all parties concerned—except the rats!

Rat-Extermination Contest, Showing the Dogs being Held in Leash at the Left of the Long Runway, While at the Extreme Right, the Rodent is being Dropped from a Cage into the Wire Inclosure

USE PETROLEUM AS FUEL FOR AIRPLANE MOTOR

What appears to some as an epoch-making event in the development of airplane and automobile motive power, is the recent successful trip near Copenhagen, Denmark, of an airplane using petroleum as engine fuel. Interest in this centers around the carburetor of the so-called dry type, an invention of a Dane, and which was attached to the 150-horsepower engine of the plane, although designed for only 80 horsepower. It was observed by experts who witnessed the test, that the plane flew just as well as with gasoline, that there was less vibration and no soot formed, nor was there any self-ignition in the engine, which ran 100 less revolutions than normally. Petroleum costs a third as much as gasoline and has more heat units per gallon.

METAL CAMP-FIRE STAKE HAS THREE ADJUSTABLE RACKS

Three adjustable racks, which may be turned, raised, or lowered according to the direction of the wind and the height of the flames, are attached to a metal stake designed for camp-fire cooking. One of the racks is intended for roasting, another holds a frying pan, while a coffeepot may be hung from the third.

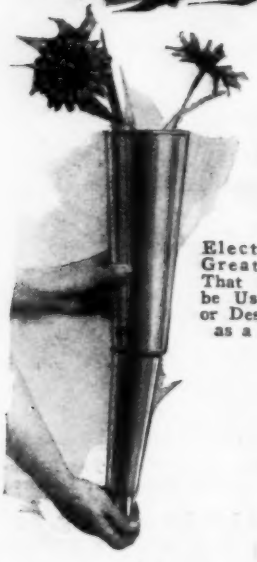
Stake for Cooking over the Camp Fire: The Brackets on the Stake may be Turned, Raised, or Lowered

¶Names and addresses of manufacturers of articles described in this magazine will be furnished free by our Information Bureau.

SOME NOVEL AND LITTLE-KNOWN ACCESSORIES

These Garment Hangers Have Two Hooks, and are Suspended from a Special Wall Bracket, Which is Easily Installed in Any Closet

Radio-Receiving Outfit Which has been Inclosed in a Highly Polished Case So That It Is an Ornament to Any Home: After the Luncheon or Dinner, the Apparatus is Brought Out and the Guests, or the Family Only, may Listen to the Broadcasting



Collapsible Vase, in Which Long or Short-Stemmed Flowers may be Displayed to the Best Advantage

Electric Lamp of Great Flexibility That Enables It to be Used on a Table or Desk, or Attached as a Wall Bracket

With This Shaving Accessory, Lather Ready for Application to the Face is Ejected by Pressing the Handle

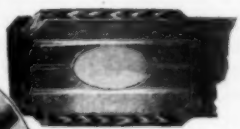
All-Metal Ice-Cream Freezer That Holds Enough to Serve 12 Persons and Requires Very Little Time for the Freezing Process

Anyone wishing further information on devices described in the editorial pages can

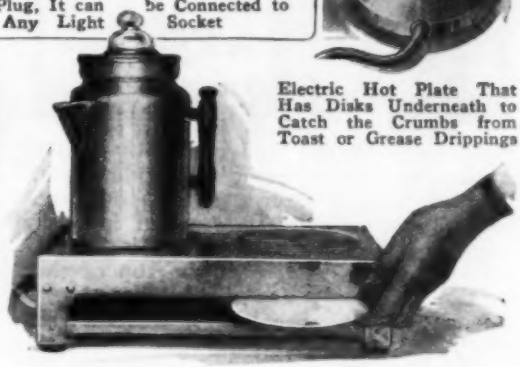
Electric Frying Pan Constructed of Heavy Spun Steel for the Preparing of Eggs, Chops, and the Like, at the Table

Strainer Funnel Having Adjustable Screens Which can be Easily Interchanged

An Electrical Appliance with Two Attachments for the Accommodation of a Coffee Percolator and Toaster, or Other Electric Outfits: By Means of an Ordinary Extension Cord and Plug, It can be Connected to Any Light Socket



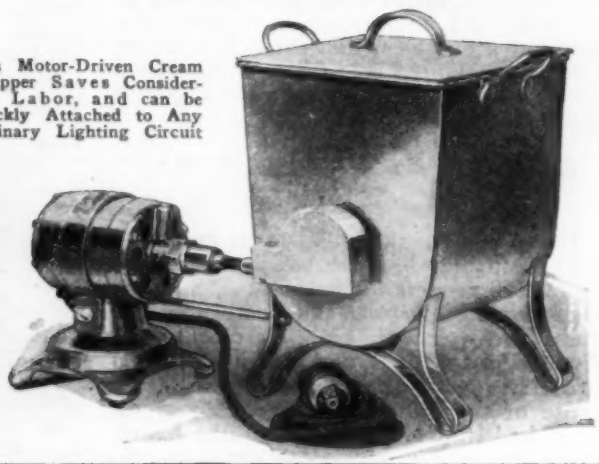
Belt Buckle Which may be Easily Taken Apart for Slight Adjustments of the Belt, as Shown to the Left



Electric Hot Plate That Has Disks Underneath to Catch the Crumbs from Toast or Grease Drippings

Window Brush Which Has a Small Water-Filled Compartment That Washes and Rinses at the Same Time

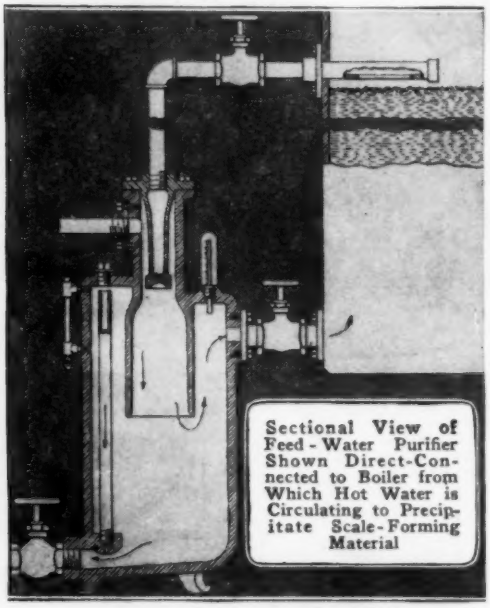
This Motor-Driven Cream Whipper Saves Considerable Labor, and can be Quickly Attached to Any Ordinary Lighting Circuit



obtain it by addressing Bureau of Information, Popular Mechanics Magazine, Chicago.

BOILER FEED-WATER PURIFIER REDUCES SCALE TROUBLES

A new device for overcoming the troubles arising from impure water in boilers precipitates the scale-forming materials before the water enters the boiler. A



Sectional View of Feed-Water Purifier Shown Direct-Connected to Boiler from Which Hot Water is Circulating to Precipitate Scale-Forming Material

pipe, entering the boiler slightly above normal low water, has a slot underneath, through which water can pass out and into the purifier by way of an injector nozzle and downwardly opening bell. Raw water entering near the top of the heater, in passing down around the nozzle and through the bell, is heated sufficiently to deposit the foreign matter at the bottom, where a suitable blow-off is located. At a connection between the body of the purifier and the boiler, water enters the boiler below low-water level. The purifier is equipped with a gauge glass and thermometer.

CITY PROVIDED WITH MUSIC BY BOY SCOUTS' RADIO

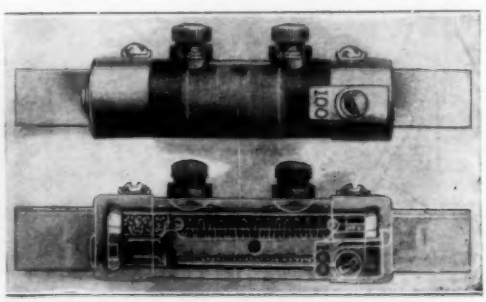
Installation of radio apparatus in a city-park band stand, from which music received from various parts of the West was amplified for the audience, was the venture originated by Boy Scouts in Twin Falls, Ida. The radio concerts proved such an immediate success, that those of the ordinary band variety were abolished, the enterprising youths being given full rein, as well as financial assistance, in their endeavor.

LARGEST ARMOR-GRINDING MACHINE IN THE WORLD

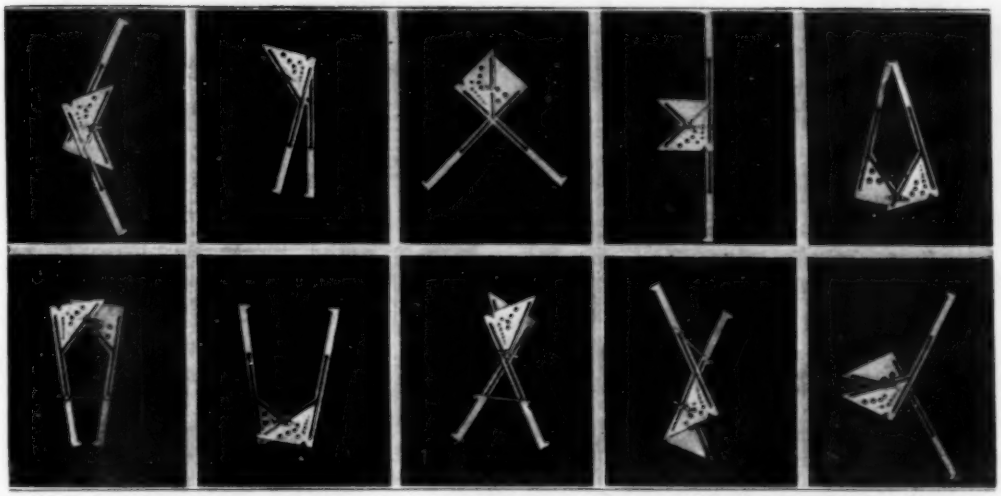
What is said to be the largest grinding machine ever made has been produced in Sheffield, England, for grinding the edges of naval armor plates. An unusual feature of the machine is that it does this grinding with the flat face of the wheel instead of with the periphery. The grinding disk is 54 inches in diamter, made of cast steel, and is divided by arms into sections filled with a grinding material, such as carborundum. Making 200 revolutions per minute it takes 120 horsepower to drive it. The total weight of the machine is 60 tons.

POLYPHASE MOTOR PREVENTED FROM SINGLE-PHASING

Polyphase motors in electric circuits are subjected to serious damage through "burning out," when a fuse on one phase "blows," thus permitting the heavily loaded motor to run on but a single phase of the current. Numerous protective appliances, such as circuit breakers, overload relays, etc., have been designed to overcome this trouble, but owing to the unstable character and surges of alternating current, these do not always operate satisfactorily. The introduction of a renewable fuse, which has a small heat coil incorporated in it, seems to have effectually solved the problem, however. These fuses are placed in a polyphase circuit in the usual manner, but the heat coil in each is connected across one of the other fuses. Therefore, if one phase receives a surge of current and blows its particular fuse, the current ordinarily flowing through this fuse immediately passes into the heat coil of a fuse in another phase. The heat resulting from the coil melts the second fuse, thereby killing the line and stopping the motor.



Top: Renewable Fuse, Showing the Terminals of the Heat Coil. Bottom: Phantom View of Fuse, Showing Location of Heat Coil



Reading from Left to Right, 10 Adjustments of the Measuring Instrument Are: Above, Bevel Protractor; Patternmaker's Caliper; Try Square; Inside Caliper or Straightedge, and Taper Gauge. Below: Two Forms of Outside Calipers; Inside Calipers; Extension Dividers, and Bevel Gauge

ADJUSTABLE INSTRUMENT HAS NUMEROUS APPLICATIONS

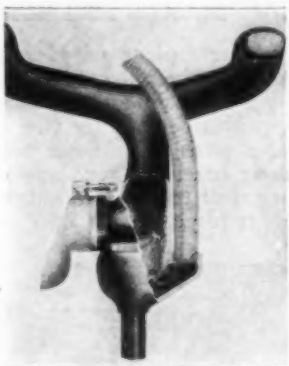
For the use of mechanics in general, an instrument that is adjustable for making measurements of a very varied nature has been recently patented. It can be adjusted for use as outside or inside calipers, as dividers, as a bevel gauge or protractor, as a straightedge, as a right angle, or 45° square, and it has a set of holes to act as wire and tool gauges. When in use as inside or outside calipers, it has a screw attachment for making very fine adjustments.

DOOR-LOCK STRIKE PLATE IS EASILY ADJUSTABLE

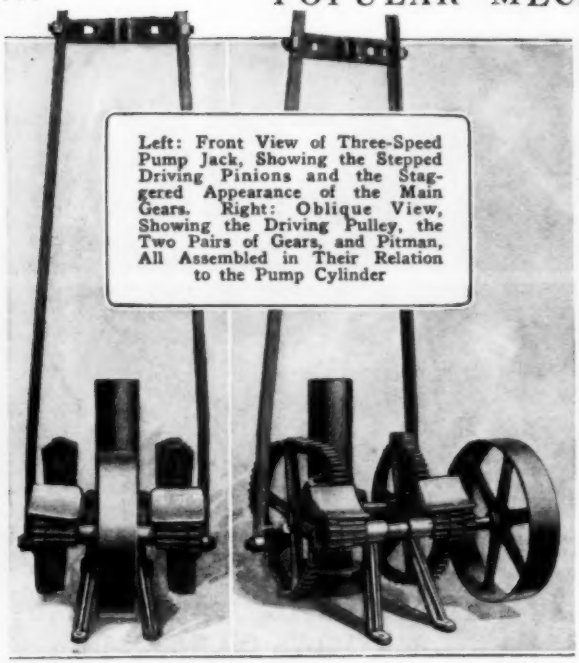
An adjustable door-lock strike plate is made with an outer and inner plate so that the latter can be raised or lowered when required, to take care of any settlement that may occur in the door frame. To adjust this inner plate, in which are the openings for the latch and lock bolt, all that is necessary is to loosen the two screws that hold the outer plate, and after adjustment to retighten them.

HEATER VAPORIZES THE HEAVY PARTICLES OF GASOLINE

It is claimed the drawbacks of other heating devices have been overcome in a new design to completely vaporize low-test gasoline. The idea is not to heat the gas already vaporized by the carburetor, which heating would lower the efficiency of the engine, but only to apply heat to vaporize the particles of gasoline that are permitted to drop into a chamber surrounded by exhaust gases. This vapor forms a relatively cool mixture with that from the carburetor, and enters the engine without fouling the spark plugs, or diluting the crankcase oil, giving a reported increase in efficiency of 20 to 25 per cent. It does not require a new carburetor.



¶An American manufacturing company has inaugurated a departure in the transporting of rubber latex, or liquid, by mixing this product with a chemical to keep it from coagulating, and then carrying it from the Malay Peninsula to this country in tank steamers.



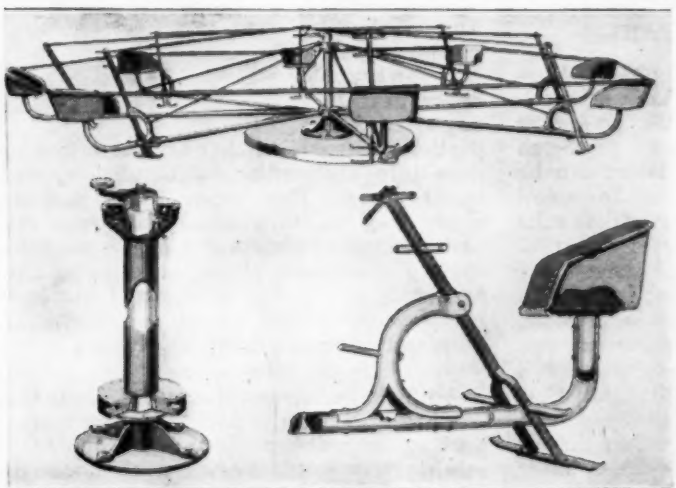
Left: Front View of Three-Speed Pump Jack, Showing the Stepped Driving Pinions and the Staggered Appearance of the Main Gears. Right: Oblique View, Showing the Driving Pulley, the Two Pairs of Gears, and Pitman, All Assembled in Their Relation to the Pump Cylinder

THREE-SPEED AUTOMATIC PUMP JACK

An ingenious pair of gears forms the interesting part of a new pump jack. The smaller gear, or driving pinion, is made with three different diameters, giving it a stepped appearance, each step being the same width as the larger or driven gear, which is of varying diameter and presents a staggered appearance, in order to correspond properly with the different steps on the pinion, at designated points in the pump cycle. The idea of this speed changing is to balance the work done in the different parts of the pump strokes, which has a tendency to reduce the power required to drive the pump. The changes are automatic and gradual, thereby giving a very smooth motion and eliminating undue strain on the pump.

SAFE PLAYGROUND APPARATUS MAKES EXERCISE A JOY

A new piece of playground apparatus, now on the market, combines the features of a tricycle and a merry-go-round. It can be operated by two or more persons, who push with their feet and pull with their arms. There are no gears, chains, or traps to become entangled in, and the centrifugal action of the swing tends to hold the child more securely in its seat. A steel band, encircling the swing, adds strength and safeguards bystanders from stepping between the seats while the swing is in motion.



Above: Moving Part of Playground Apparatus, Showing Arrangement of Seats. Lower Left: Pedestal Support. Lower Right: Close-Up of One of the Seats, Showing Propelling Mechanism

CHANGES IN LIBERTY MOTOR RECTIFY FORMER DEFECTS

Changes in the Liberty motor have been made by naval experts that have resulted in making possible long-distance airplane flights without even so much as the changing of a spark plug. As is well known, the original Liberty motor had several faults, the most serious of which was the failure of the timing gears. This was first remedied by redesign. Additional grooves and holes in the pistons prevented oil from getting into the combustion chamber, and causing spark-plug trouble. The ignition system was greatly improved by substituting a 12-volt for the original 8-volt system. With these changes flights have been made of 25 hours' duration.

PENINSULA OF SOUTH AFRICA ENCIRCLED BY A DRIVEWAY

For several years work has been in progress upon a roadway to encircle the entire peninsula at the southern extremity of South Africa, upon which Capetown is situated. The roadway is now completed, and at the opening ceremonies, last May, it was claimed to be the finest marine drive in the world, surpassing even the famous Corniche Road, at Mentone, in the south of France. The road is 125 miles long, and for most of its length is hewn in the rocky sides of the mountains that tower over the entire seacoast of the cape.

SMALL POUCH FOR MAILING SOUVENIR CARDS

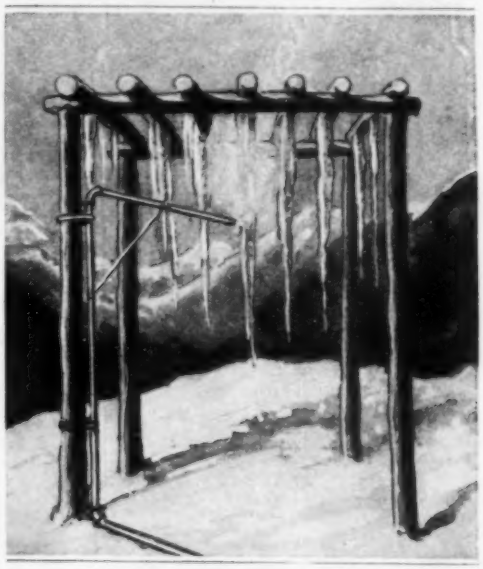
Made in the form of the regular U. S. mail pouch, a miniature bag for the inclosure of photographs or souvenir cards has been put on the market. A tag for the addresses of the sender and recipient

Small Bag, Constructed after the Pattern of a Government Mail Pouch, for Use in Sending Souvenir Post Cards

is attached, and the pouch is mailed at the regular rate of postage. A note or letter may, therefore, be inclosed with the pictures.

PUREST ICE MANUFACTURED ECONOMICALLY

At a famous sanitarium in the Swiss Alps, a simple method is in use for the economical production of pure ice. The ice plant consists of a structure having four upright posts, about 10 feet long, arranged in a square with 4-foot sides. Cross timbers at the top form a skeleton roof. A 1-inch steam pipe connecting with the boiler room, rises up one of the posts and terminates in a nozzle near the top of the structure. Steam from the nozzle is projected against the underside

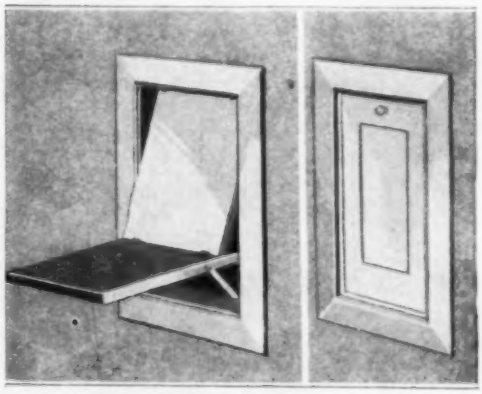


Simple Arrangement Used to Obtain Pure Ice at Low Cost in the Swiss Alps

of the roof timbers, where it condenses and forms into icicles, which are later broken off and stored.

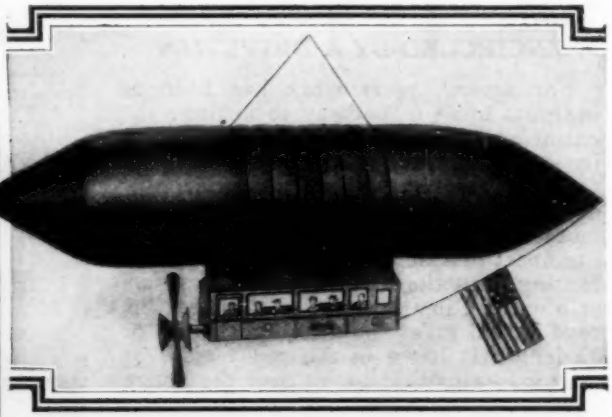
CONVENIENT BATHROOM SEAT FOLDS INTO WALL

Convenience and economy of space are aptly illustrated in a recently introduced bathroom seat, which can be folded into the wall when not in use. The seat is the door of a small cabinet that can be fitted between two of the wall studdings in any ordinary house, thus not taking up any valuable room when folded.



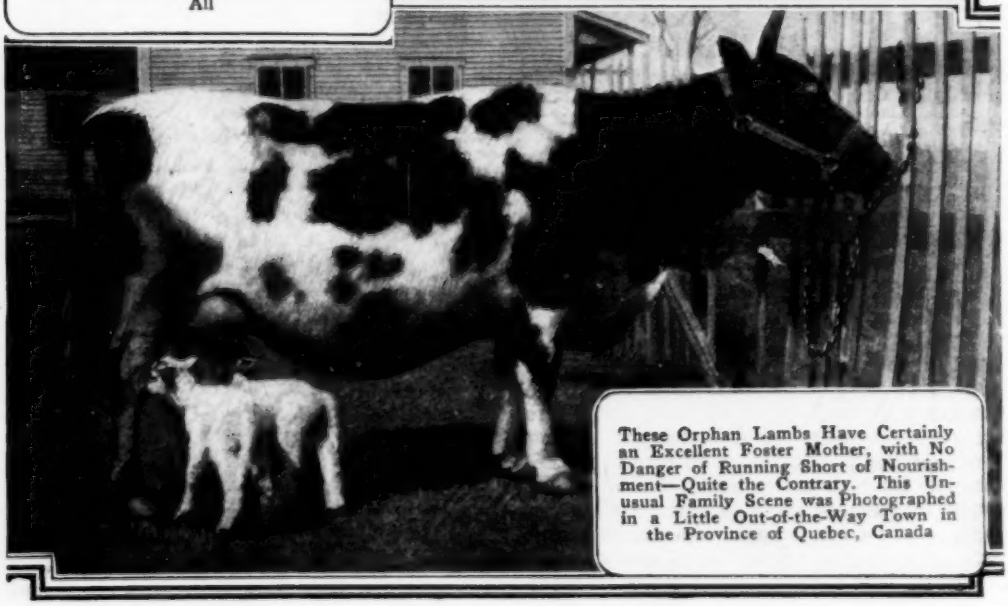
Left: Bathroom Seat Shown Pulled Out of the Wall Ready for Use. Right: Seat Folded Back into Cabinet

Of All Nests, a Humming Bird's Is the Hardest to Find, Both on Account of Its Smallness and the Cunning Way in Which It is Hidden. Here Is One That was Not Only Found but was Also Photographed—Mother Bird and All



This Toy Dirigible Balloon Comes to the Home Folded Up and Packed in a Flat Envelope. Instructions Come with It, Explaining How to Convert the Folded Parts into a Car with Propeller and Connections to the Gas Bag After It is Inflated, When It Measures 24 Inches in Length and 5 Inches in Diameter

Here Are Two Gophers—Usually the Shyest of Animals—Apparently Posing of Their Free Will for the Photographer. The Picture was Taken in British Columbia



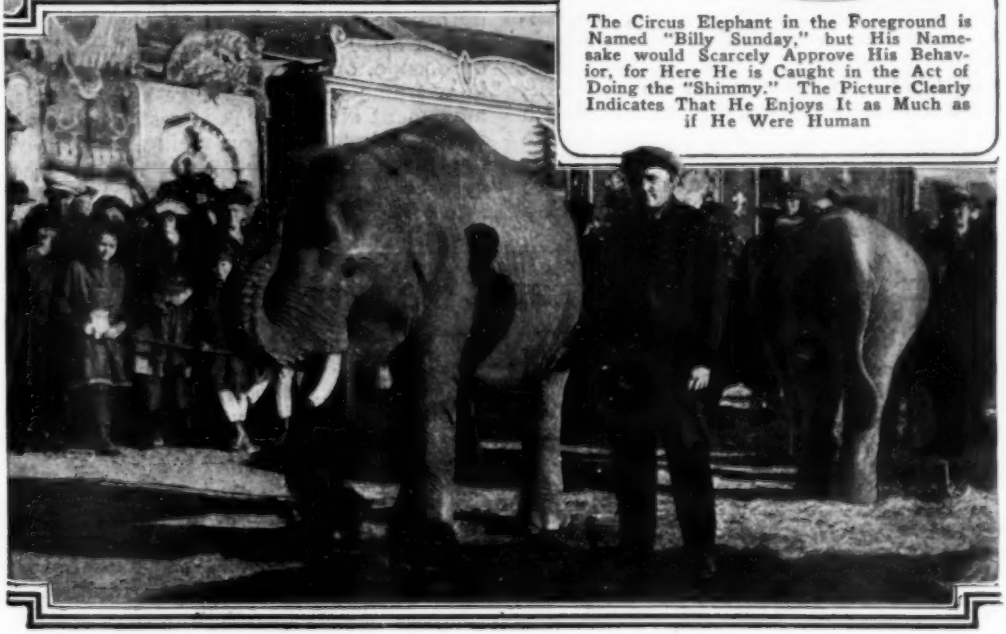
These Orphan Lambs Have Certainly an Excellent Foster Mother, with No Danger of Running Short of Nourishment—Quite the Contrary. This Unusual Family Scene was Photographed in a Little Out-of-the-Way Town in the Province of Quebec, Canada

Florence Froude, of San Bernardino, California, Only 6½ Years Old, Looks Sturdy and Certainly does Not Belie Her Appearance, for, Swimming with Her Hands Tied behind Her, She Towed the Boatload of Heavyweights, Shown at Left, a Distance of 50 Feet

When Wound Up, This Mechanical Duck Acts Just like a Real, Live One. It Walks About 25 Feet, and When Placed in the Water, Swims for 10 to 15 Minutes

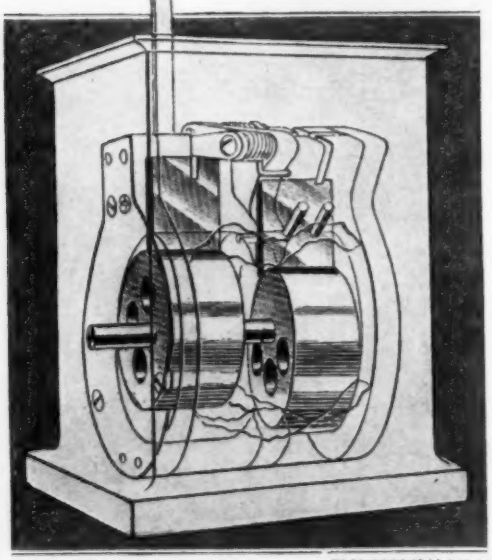
The Bank Shown Below Is Wireless in the Radio Sense of the Term. When a Coin is Placed in the Proper Position, It will Not Go into the Bank Until Told To

The Circus Elephant in the Foreground is Named "Billy Sunday," but His Namesake would Scarcely Approve His Behavior, for Here He is Caught in the Act of Doing the "Shimmy." The Picture Clearly Indicates That He Enjoys It as Much as if He Were Human



SIMPLE AND EFFECTIVE PUMP CREATES HIGH VACUUM

With a new air pump of simple construction, it is possible to obtain a so nearly perfect vacuum that the pressure of the remaining air is only .001 millimeter, the normal open-air pressure being about 760 millimeters. It is designed for use in laboratories and other places where the quantity of air to be handled is comparatively small. A solid eccentric cylinder, balanced by being perforated on one side, rotates in a cylindrical shell provided with two openings. One opening leads to the chamber to be exhausted, while the other communicates with the atmosphere through a suitable valve. By means of a spring and lever, a valve, sliding in a slot in the outer cylinder, is kept in constant contact with the rotor, and by this means, the latter and the outer cylinder always touch at two points, thereby dividing the pump chamber into two parts of varying capacity. The pump consists of two similar units mounted upon the same shaft, one serving as the preliminary to the other. The whole is mounted in an iron box, on the outside of which are pulleys from the common shaft for connecting to a motor of only one-tenth horsepower.

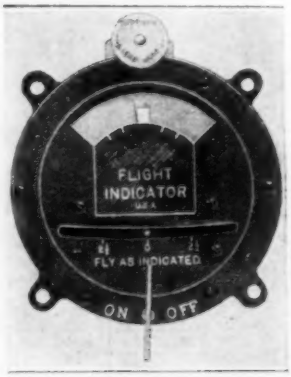


BY COURTESY OF LA NATURE

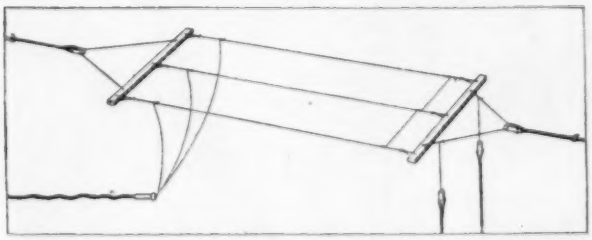
High-Vacuum Pump for Laboratory Use, or in Places Where Small Volumes of Air are Handled, Shown in Phantom View

FLIGHT OF AIRPLANE SHOWN BY GYROSCOPE INSTRUMENT

Handling an airplane in clouds or in a fog is uncertain because the earth, otherwise the means of checking direction and balance, is invisible. The compass is not steady enough, but a new instrument is used to assist the pilot. A Venturi tube, placed in the air stream of the propeller, produces air pressure to drive a small gyroscope, to which it is attached by tubing, at 8,000 revolutions per minute. The gyroscope, on a lateral axis, is suspended in a frame hung in a fore-and-aft axis, movement about which is restrained by a spring. A turning or tilting motion of the plane influences the action of the gyroscope so that it is indicated on the face of the instrument.

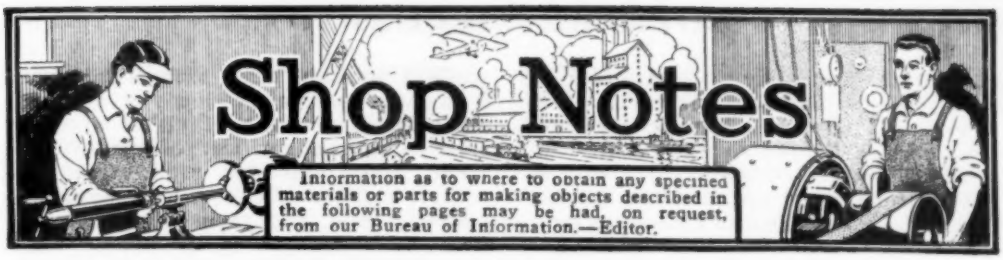


READY-MADE RADIO AERIAL NOW ON THE MARKET



Wireless Aerial That Is Complete in Every Detail, and Which can be Erected in 10 Minutes, Shown Stretched Ready for Operation

Complete in every detail and capable of being erected in ten minutes, describes a radio aerial, which is now available on the market. Specially treated copper wire, the joints of which are properly twisted and soldered, glazed-porcelain insulators tested for tensile strength, and kiln-dried, chemically prepared hardwood arms, are the essential features of the outfit.


Shop Notes
Information as to where to obtain any specified materials or parts for making objects described in the following pages may be had, on request, from our Bureau of Information.—Editor.

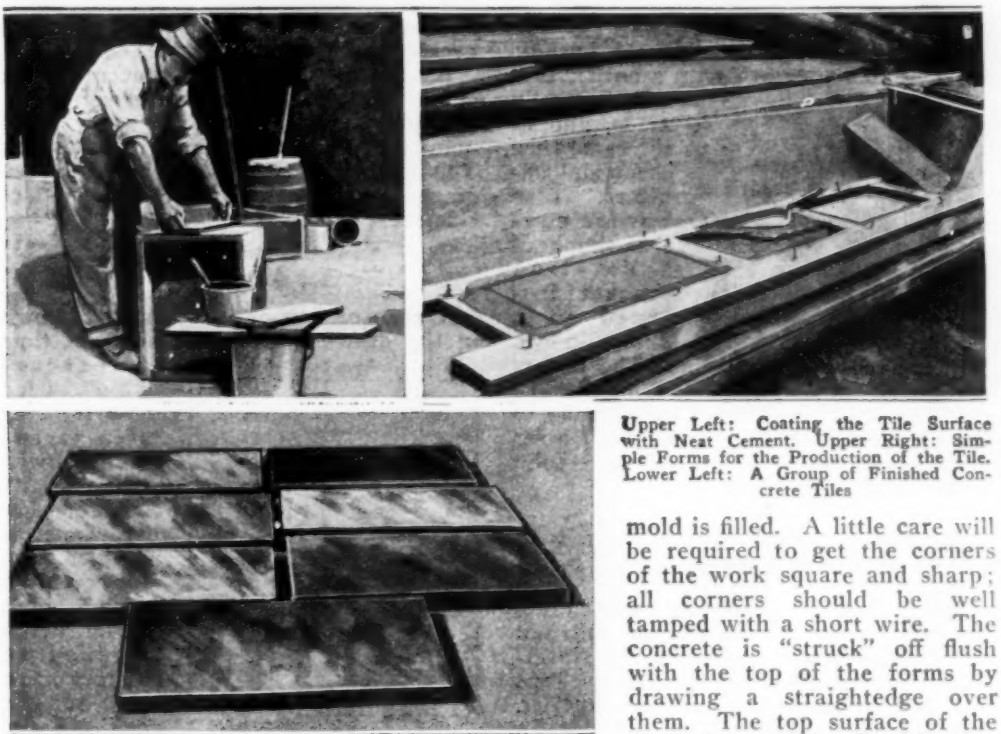
How to Make Concrete Tile

By HJALMER LINDQUIST

FLOORING, wall facing, garden walks, etc., are some of the common constructions in which concrete tiles are used. These tiles are not at all difficult to make, and the results of their use are well worth the time expended.

When only a few tiles are wanted, the forms can be made from two pieces of board, tacked flat to a wide plank, with other pieces tacked between them at right angles, to divide the individual tiles. The nails with which the boards are fastened are only partly driven in, so that they can be easily pulled when the tiles have set. These forms should be squared, and the lumber from which they are made should have straight, smooth edges. If a considerable number of tiles are to be made, it will, of course, pay to have good forms ready beforehand so that the work can be done quickly.

The forms are filled with a wet concrete mixture of 3 parts sand and 1 part cement. Some kind of reinforcing wire should be placed in the center of each tile to strengthen it; a coarse wire mesh will serve the purpose. The form is half-filled with concrete, the reinforcing put in, and the rest of the cement applied until the mold is filled. A little care will be required to get the corners of the work square and sharp; all corners should be well tamped with a short wire. The concrete is "struck" off flush with the top of the forms by drawing a straightedge over them. The top surface of the tile is left rough. Cleaning the top edge of the form, next to the tile, with the point of a trowel, will help give the tiles a better appearance when they are dry.



Upper Left: Coating the Tile Surface with Neat Cement. Upper Right: Simple Forms for the Production of the Tile. Lower Left: A Group of Finished Concrete Tiles

When finished, the tiles should be allowed to dry, before they are taken from

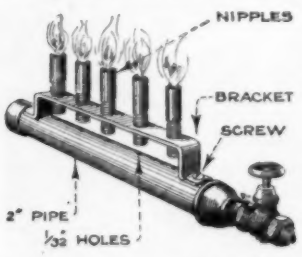
the forms, preferably in the shade, as rapid setting is not advisable. They should then be soaked in water for about two days to harden them. After being removed from the water, they are allowed to dry overnight, and the top surfaces are coated with a neat cement, which is a mixture of cement and water, a little thicker than cream. Whipping the cement while mixing it seems to give a slight gloss to the work. A little of the neat cement mixture is spread over the tile surface and shaken into contact and smoothness by rubbing the bottom of the piece over a thin layer of sand sprinkled on a smooth surface. When the top coating has set for a day, the tiles should be placed in water for a day or two, then allowed to dry for a day before coloring.

Coloring of the tiles is effected by inexpensive chemical solutions. A saturated solution of copper sulphate, or bluestone, gives a bluish-green color, while a solution made from sulphate of iron or copperas produces a rust-red. By using a solution of either of these salts as a mordant, any of the dry cement colors can be used. The dry cement color is mixed with water to the desired shade, and then about 1/25 part, liquid measure, of either copperas or bluestone solution is stirred in. A syringe should be used in applying the colors; with this the colors can easily be varied and blended together on the surface of the work.

The tiles should be set in soft mortar, on a solid base, and the appearance of the work is often improved by spacing the tiles about ½ in. apart and filling this space with colored mortar. To color the mortar, the dry colors can be mixed with it directly. The tiles shown in the illustration are about 7 by 14 in. and ¾ in. thick. Other sizes, of course, can be made in the same manner.

Gas Burner for Heating Furnaces

The high cost of gas-furnace burners led a householder to devise a burner that is very easily made, and at the same time cheap and efficient. The burner consists simply of a flat-iron bracket fastened to a 2-in. pipe by a machine screw at each end. The burner tips screw into holes in the bracket, so that they can be adjusted individually to the proper distance from the small holes that serve as outlets for the gas.—John H. Schalek, Pittsburgh, Pa.



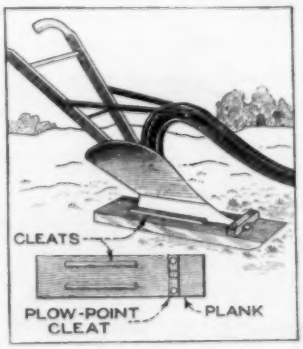
Strength of Douglas Fir and Southern Pine

There is little difference between the strength of the southern pines and that of Douglas fir from the Pacific Northwest, as government tests show. True long-leaf yellow pine averages heavier, stronger, and tougher than Douglas fir. True short-leaf pine averages heavier and tougher than fir, but is about equal to it in strength when used as a beam or post. Loblolly pine, though averaging heavier than the fir, is somewhat weaker. The difference in strength between any of these pines and Douglas fir, however, is not so great but that low-density pieces of the one species are weaker than the average for the other species.

As far as strength is concerned, the choice between any of two lots of southern pine and Douglas fir will depend upon the grade and density of each lot. The mountain type of Douglas fir averages considerably weaker than the Pacific-coast type.

Runner for a Plowshare

A shoe or runner, such as that shown in the drawing, will save a lot of time and energy when the plow is being taken to and from the field. A thick plank of oak, or other hardwood, is provided with a cleat in which a notch is cut; this is fastened to the forward end of the shoe and the point of the plow inserted into the notch. Cleats nailed on either side of the share serve to prevent it from slipping off to one side. The front end of the shoe is beveled or rounded off, so that it will ride over any obstruction in its path.—F. H. Hanford, Detroit, Mich.

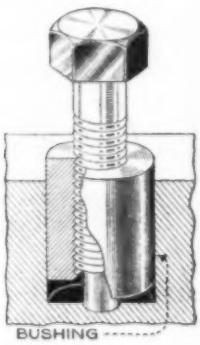


Antique Color for New Parchment

New parchment can be given the appearance of great age by soaking it in a 5-per-cent solution of potassium permanganate and then washing in clean water. The solution acts very quickly, and care must be taken that the parchment is not allowed to remain in it too long, or the color will be too dark. If the parchment should be a little greasy, wash it with soap and water, and rinse before placing in the permanganate solution. If the parchment is to be pasted to anything, as, for example, the covers of a book, fasten it to a board with thumbtacks and allow it to dry slowly.—Jean L. Martin, Paris, France.

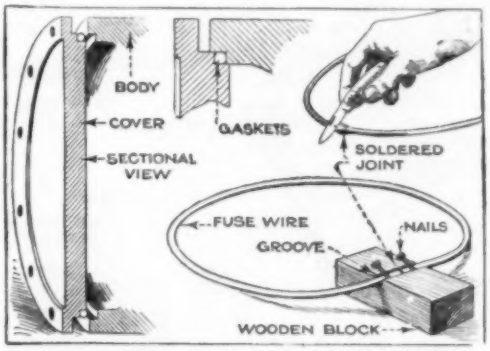
Removing Bushings from Blind Holes

Although it is easy to install a bushing in a blind hole, its removal is an entirely different matter. The shopman is frequently called upon to remove such a bushing, and the method described may help when he meets with an obstinate case. The bushing hole is first tapped, using a bottoming tap, and running it down to the bottom of the hole; this will thread all but a very small length of the bushing. An ordinary bolt with the same size thread as the tap is turned down or filed so that a portion of the end is smaller than the bore of the bushing. By screwing this bolt into the threads cut on the inside of the bushing, the end of the bolt strikes the back of the hole and the bushing is forced out. If the bolt screws into the end of the thread before the bushing is entirely out, the bolt may be removed and a small block placed below; this will usually give enough additional purchase to finish the job.



Fuse-Wire Gaskets for Tight Joints

Cutting gaskets from sheet lead, as usually performed, is wasteful, and it is also difficult to cut them uniformly without special tools. In addition to this, if the surfaces to be jointed are not true at all points, great pressure will be required to make the joint tight. On a small ice machine, 40-ampere fuse wire was used instead of sheet lead, with entirely satisfactory results. A step was cut in the cover of the machine, as shown, and the wire laid in this step and cut so that the ends just met. A groove was then cut

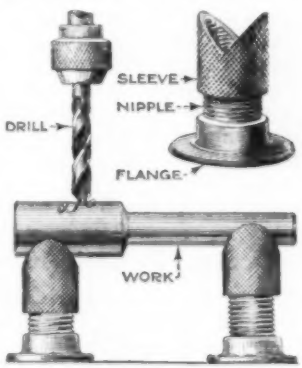


Fuse Wire Used Instead of Sheet-Lead Gaskets, in Ice-Machine Cylinder Heads: The Method of Jointing the Ends of the Wire is Shown at the Lower Right

in a small block of wood, and the ends of the fuse wire held together, in the groove, with small nails. Soldering paste was applied and the ends soldered, after which the joint was trimmed smooth with a pocketknife. With the lead ring in place, very little pressure was needed to make a gas-tight joint, as the wire squeezed out against all four sides of the joint.

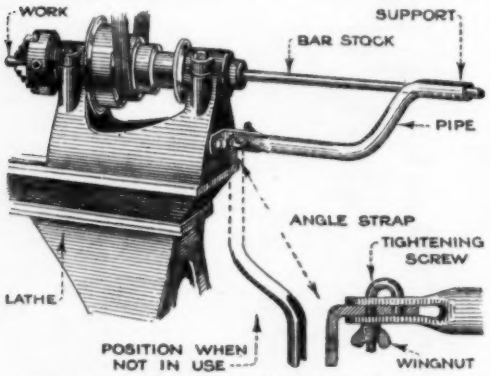
Adjustable V-Blocks from Pipe Fittings

One of the handiest sets of V-blocks for use on the drill press or milling machine can be made with a minimum of machine work, from standard pipe fittings. These blocks are adjustable for height, which makes them particularly serviceable when the work is to be supported at points having different diameters. The base of each block is made from a pipe flange, which needs no machining whatever. The standard is a short nipple screwed tightly into the flange. The "V" proper is made from a threaded sleeve or coupling, having a knurled outer surface. The 90° "V" can be cut out with a saw and finished by filing.



Supporting Long Bars in a Speed Lathe

Speed lathes are not, as a rule, equipped with any means for supporting long bars, and, as it is impossible to run these at any



A Support for the Speed Lathe Makes It Possible to Work from the Bar without Cutting the Stock into Short Lengths

speed without support of some kind, the general practice is to cut the long stock into short lengths. In this manner a pile of short ends, which have no more than junk value, soon accumulates. This type of lathe is not always used for bar work, so the support illustrated has the advantage of being readily dropped out of the way, yet remaining a part of the machine.

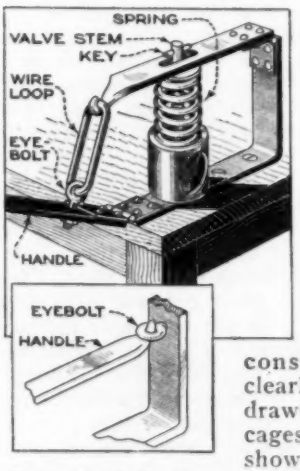
A piece of iron, bent to form a right-angled bracket, is bolted to the end of the machine, and a piece of pipe is slotted at one end to fit over the bracket. The pipe is then bent at a convenient distance, and the top bend is ground or cut away to allow the bars to pass through. The two parts of the support are connected by a U-bolt, as shown, the long end of which is threaded for a wingnut, so that the device can be swung up into position or released in a few seconds, the only necessary operation being the tightening or releasing of the hook bolt.

Finding Unusual Armature Trouble

The armature of an automobile generator had been rewound, and it tested perfectly until assembled in the frame; then it refused to develop full voltage, and, when run as a motor, it turned with a strong torque even when the field coils were disconnected. Ordinarily this would immediately suggest a wrong brush position, but the brushes on this machine were fixed and nonadjustable. The only remaining possibility was that the armature-coil ends were all brought the wrong distance around the commutator before being connected. Before this accusation could be brought against the armature winder, who had otherwise done a good job, it was necessary to prove the fact by a test. The test used was simply to touch two brushes to the commutator, the proper angular distance apart, and find with a compass the axis on which the armature iron was magnetized. If the armature had been properly wound, the armature poles should have come out about midway between the field poles; as they came out far from this position, it proved that the leads were all connected to the wrong bars.

Compressor for Cage-Valve Springs

Usually it is a difficult and slow job to compress the springs and remove the keys in the cage-type valves used on a number of automobiles, but the easily made device illustrated makes it possible to do this very quickly. The compressor is made of ¼-in. flat-iron stock, and is bolted to the workbench, its construction being clearly shown in the drawing. The valve cages are placed as shown, and the handle pushed downward, the valve stem and key extending through a slot cut in the top member. With this rig, the keys can be removed and replaced almost as fast as the cages can be placed in position.



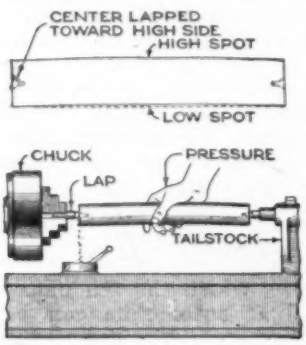
In the insert a type of construction is shown in which the handle has a hooked end that is placed in eyebolts spaced at intervals along the upright member; this device will take valves of any size. However, a simpler method would be to bore ⅜-in. holes in the upright through which the hook could be inserted. This construction may also be used in place of the lower hinge, which requires more work in assembling than the eyebolt method, although it possesses the advantage of having all parts connected, so that no individual parts can be lost or mislaid—a decided advantage in most shops.—D. C. Stephenson, Augusta, Kan.

Using Old Blueprint Paper

Having some blueprint paper that had become "stale" in the roll, that is, darkened without having been exposed to the light, and receiving a small order for prints that amounted to less than the cost of a new roll, I decided to make an attempt to use the old paper on hand. The print was exposed in bright sunlight, but, instead of using cold water, the exposed print was washed in hot water, the result being a perfectly legible blueprint. —Edwin J. Bachman, Fullerton, Pa.

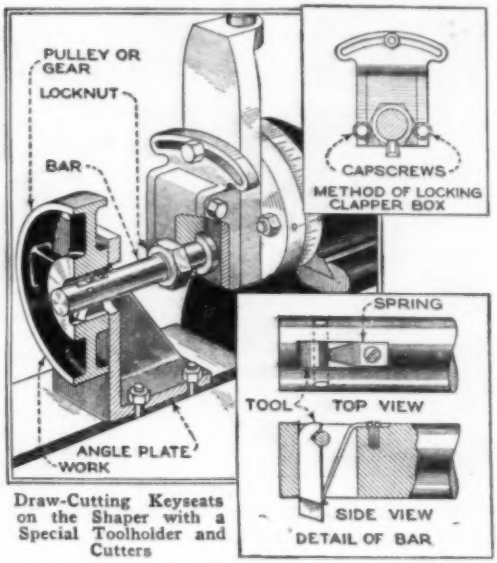
Lapping Wristpin Centers

After a large number of air-compressor wristpins had been made up and hardened in the usual way, it was discovered that the steel used was different from that customarily used for this work. The heat-treating process had caused the work to warp so badly that most of the pins would not clean up in the finish-grinding operation, and to save the pieces the centers were lapped with a copper lap which was charged with emery. The high spot in the center of the pin was marked with chalk and pressure exerted in an opposite direction when the piece was placed on a speed lathe in the manner illustrated. The lap was first turned up to a 60° angle and then smeared with medium emery and oil. When, after continued lapping, the lap had worn out of shape it was again brought to shape by using a file and center gauge. The amount the centers were lapped depended upon the amount of warp, most of the pins cleaning up with a lapping of .01 in. off center.



Keyseating Fixture for Use on the Shaper Head

Keyseating operations in small shops are usually assigned to the shaper, but to do the work in this manner is objectionable because of the chattering of the gooseneck tool and the breaking away of the front edge of the keyseat. All these and other difficulties can be overcome and heavier cuts taken by the use of the cutter bar shown in the drawing. The bar is fastened to the clapper box in place of the regular toolholder, and a locknut is provided to hold the bar in the proper position. The tool bit is held in the slot



Draw-Cutting Keyseats on the Shaper with a Special Toolholder and Cutters

of the bar by a tool-steel pin. The upper end of the tool bit is ground off to a radius that allows it to swing in an arc and lift on the return stroke. A flat spring, fastened to the top of the bar, holds the tool in the cutting position, but allows it to lift on the noncutting stroke of the ram. Although a single tool of this description will not answer for all sizes of work, it is simple to make, and a variety can be kept on hand, or made up as required.

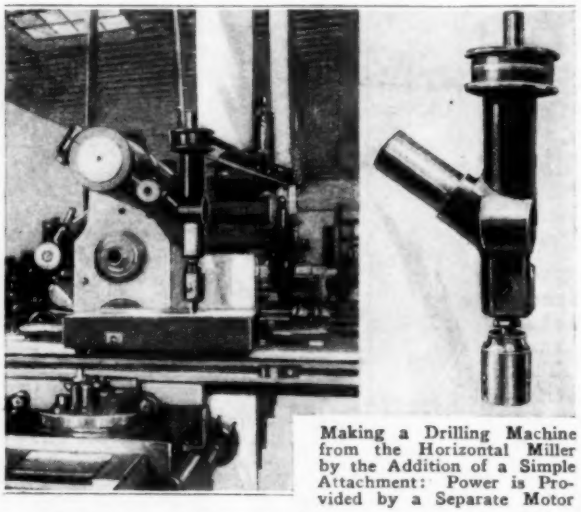
To use a draw-cut tool bar, the clapper box must be tightly held; so holes are drilled and tapped in the outer flanges of the box, and capscrews and washers are used to clamp it and prevent lifting.

The work is mounted on an angle plate in alinement with a hole of sufficient diameter to permit passage of the bar. Greater accuracy and heavier cuts are possible with the draw-cut method, and all causes of chatter and vibration are overcome. Also, the ability to work to the layout line, which is not broken away, is another advantage of such a tool.

In fitting up the cutter for the draw-cut bar, grind it to make a neat sliding fit in the bar slot, and also grind a notch in the tool bit, to allow it to move in an arc without any lost motion on the pin.

Attachment Makes Drilling Machine from Horizontal Miller

Drilling, reaming, and other operations usually done on a drill press, can be done on a milling machine by the use of an attachment similar to the one illustrated. The attachment is a simple casting with an arm cast at an angle to the perpendicular section, the arm being machined to fit into the overarm of the miller. The vertical part of the device is cast hollow and bored for spindle bushings; to the upper end of the spindle a pulley is attached. The power to drive the drill is provided by a separate motor through a quarter-turn belt.—J. H. Rouse, San Francisco, Calif.



Making a Drilling Machine from the Horizontal Miller by the Addition of a Simple Attachment: Power is Provided by a Separate Motor

Corrosion of Oil Tanks

Investigations carried out on behalf of insurance associations have shown that steel oil tanks, buried in cinders, show greater corrosion than when buried in other materials, probably because of electrolytic action between the steel and carbon in the cinders.

The best coverings, in the order of merit, are: oily sand, sand, gravel, clay, loam, and cinders. It was also shown that ground or tide water do not stimulate corrosion to any great extent. Steel tanks, buried under favorable conditions, should last more than 30 years. In damp ground this time will be reduced to between 15 and 20 years.

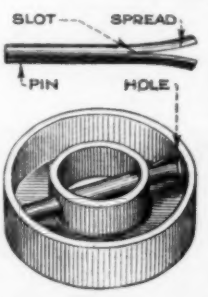
Tanks should be coated with red lead and asphalt and buried 3 ft. or more below the surface; ground and tide water should be avoided as far as possible.

Emergency Repair for Stripped Thread on an Auto Axle

A trouble that is frequently met with in rear-axle shafts of some types of automobiles, is the stripping of the threaded end and consequent failure of the nut, which holds the wheel in place, to grip on the axle. An emergency repair that will hold until a new shaft can be obtained, is effected by drilling a ¼-in. hole about 1 in. deep into the center of the axle, parallel with its axis. A tapered punch is driven into the drilled hole to expand the stripped end. It is only necessary to expand the end of the shaft a small fraction of an inch, after which a new thread can be cut. For the purpose of recutting the thread, in the absence of a regular die, the castellated nut can be run up on the axle in an inverted position. The nut, in most cases, is casehardened, and a serviceable thread will result, especially if portions of the original thread remain as a guide for the improvised threading die.

Locking a Fan-Pulley Pin

An expedient by which the fan pulley of a standard light automobile can be securely locked on the crankshaft, is indicated in the drawing. The pin, as commonly used, frequently works loose and drops out; this is prevented by splitting the outer end of the pin with a hacksaw. The ends are bent apart and the pin is driven into the hole. After the end of the pin has passed the rim of the fan pulley, the ends expand in such a manner that they must be compressed with a pair of pliers before the pin can be removed.



Dressing and Cleaning Leather Belts

In service, a belt gradually loses a portion of its lubricating material, so that, unless this is renewed at suitable intervals, the durability of the belt is impaired. A good grease or dressing gives the belt sufficient flexibility, and at the same time causes it to cling to the pulley, but does

not subsequently stiffen or injure it in any way. Among the best belt dressings are mixtures of cod and neat's-foot oils, with tallow, and wool grease free from mineral acid.

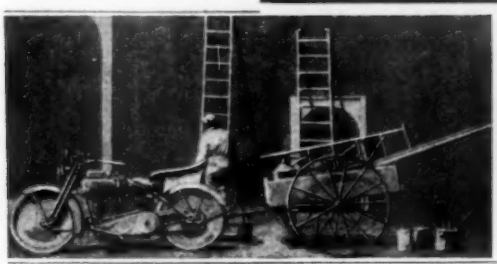
Clean the belt well, especially on the pulley side, by washing it with warm water and a good neutral soap, such as castile or white toilet soap, and, if necessary, scrape it on the pulley side to remove any dressing and dirt that may be caked there. Caking of dressings is injurious to the belt and also causes it to run unevenly. Wash rapidly and under no circumstances permit the belt to become wet, as it will then stretch and slip, and cemented joints may become loosened. Apply the dressing, which may be either liquid or solid at ordinary temperature, to the outside of the belt, while it is at rest, and allow it to soak overnight. It should be applied very evenly and rubbed in with cotton waste, felt, or similar material. If absolutely necessary, a very light dressing may be applied to the pulley side of the belt, using cotton waste or felt lightly coated with the dressing. Even distribution and penetration should be aimed at. Resin, or greases containing it, weaken the belt and shorten its period of service. The use of too much dressing causes undue stretching and loss of grip. Belts should never feel greasy or look greasier than when they were installed. Because a little belt dressing is good for belts, it does not follow that more is better; just as little as possible should be used, but enough to make the belt flexible, and cause it to cling to the pulleys.

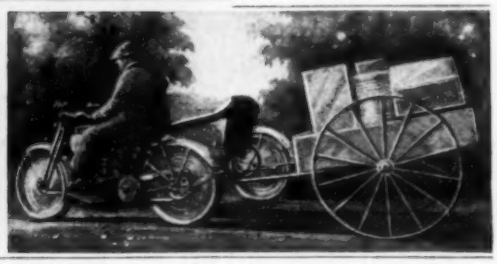
How to Make a Motorcycle Trailer

By J. R. KOONTZ

THE painter, carpenter, paperhanger, mason, or other tradesman doing a jobbing business, or the farmer, will find a trailer for a sidecar motorcycle a practical addition to his equipment.

The trailer shown in the illustrations is mounted on a pair of wheels taken from an old hayrake, and runs on a pipe axle, although one of solid steel could be used. The axle should be long enough so that the wheels will track with a regular wagon, 56 in. center to center, or with the motorcycle and sidecar. The box bed of the trailer is 4½ ft. long by 3 ft. wide, and 8 or 10 in. deep. Make it with loose end gates so that they can be removed in case it is necessary to haul ladders, lumber, or other long articles. The sideboards are fastened to the bed with bolts, in the same manner as on an ordinary farm wagon. When finished, the box is balanced on the axle so that the weight will be uniformly distributed. The axle may be bolted to the center of the box by drilling holes through the metal and wood, or fastened, as in the drawing, by using brackets or straps, forged from flat iron, and collars to prevent sideplay; all should be provided with setscrews.

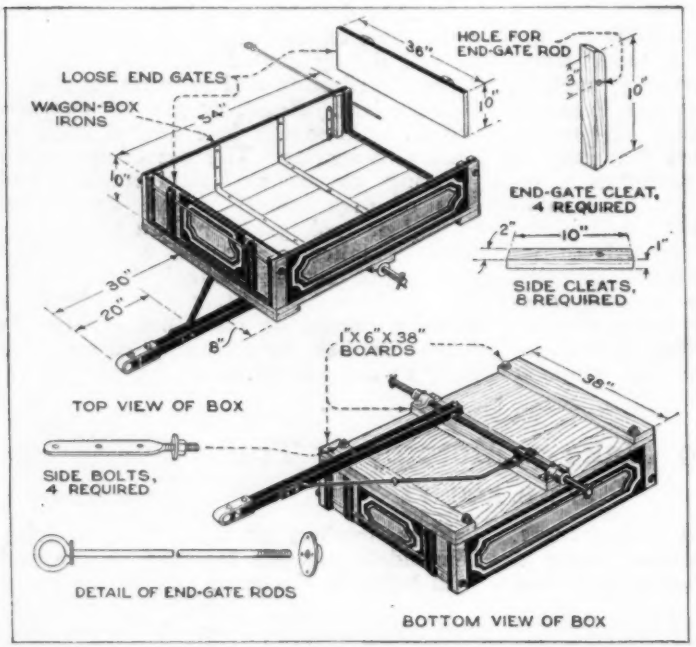




An Easily Made Trailer for Attachment to a Motorcycle and Sidecar: The Pictures at the Center and Left Show the Use of Such an Outfit for Hauling Painting Equipment. Right: The Same Equipment Used for Hauling Supplies to the Farm

The trailer hitch is made either of angle iron or wood; the latter will perhaps be the easier to get, and for this purpose, a piece of 2 by 4-in. hardwood will

answer; it must be long enough to reach from the axle and project about 30 in. beyond the front of the box. An iron brace is also required, and this should be bent so that it will meet the hitch about 20 in. from the end, and extend back at an angle to the right-hand side of the bed. This arrangement makes the hitch solid, helps to equalize the draft, and distributes the pull without undue strain on the motorcycle or sidecar. The hitch must be placed on the left-hand side of the trailer, so that the latter will track with the motorcycle and sidecar, and should be attached to the sidecar frame as closely as possible to the main frame of the motorcycle, so that the pull will be nearly behind the latter; otherwise too great a strain would be placed on the frame of the sidecar.



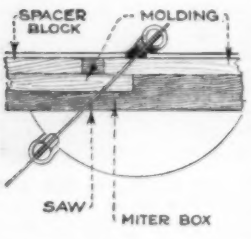
Detail Drawings, Showing the Simplicity of Construction of the Motorcycle Trailer: Such a Trailer can be Easily Built in the Farm Shop

If something of neater appearance is desired, two old motorcycle wheels, mounted on suitable axle spindles, can be used instead of the iron wheels; this will reduce the noise and allow the trailer to run much more smoothly.

In the winter months, when the ground is covered with snow or ice, the wheels can be removed from the trailer and a pair of runners substituted.

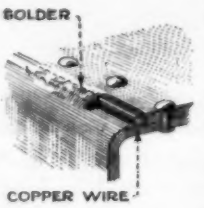
Making Invisible Molding Joints

Amateur craftsmen who have had occasion to use odd pieces of molding know some of the difficulties of making good joints. The method illustrated makes a joint that is practically invisible, and is very easily followed. The pieces to be cut are both placed in the miter box and the ends that are to be fitted together have their angles formed by a single cut of the saw; as both pieces are cut exactly alike, a perfect joint will result. A spacer block, of the same thickness as the molding, is necessary to fill up the space between the side of the miter box and the second piece of molding.—L. H. Georger, Buffalo, N. Y.



Simplifying a Difficult Soldering Job

When soldering the joints on the brine tank of a small refrigerating machine, trouble was experienced in making the solder take hold on the galvanized sheet iron used in the construction. After a number of futile attempts with different fluxes, each resulting in a gaping, leaking seam, the method illustrated was used with success.



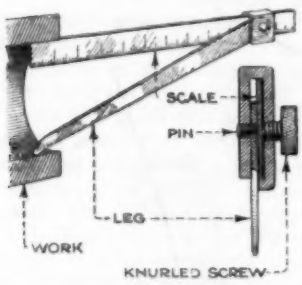
The sheet metal was fairly heavy, so some No. 18 copper wire was skinned of its insulation, brightened with sandpaper, covered with soldering paste, and laid along the edge of the seam. Undiluted muriatic acid was applied to the adjacent galvanized metal, and, with a hot iron, the solder was wiped on smoothly; it flowed easily over both metals, and a perfect joint was made.

Improved Small Generator Brushes

Where carbon brushes are used, the generators on some makes of automobiles often fail to charge the storage battery as they should, on account of poor contact. To overcome this trouble, drill a hole through the brushes from face to top, and insert a bunch of very fine copper wires that will fill the hole as tightly as possible, then trim them off flush with the face of the brush. This will increase the output considerably. The copper cores should be staggered so that they will bear on the commutator in different places.—O. G. Crooks, Newcastle, Pa.

Caliper Attachment for Scale

By attaching a caliper leg to a 12-in. scale a tool is obtained that can be used to test whether or not a long hole has been bored straight. Every mechanic knows that a slight taper in a long hole is easily overlooked when calipers are used to measure the diameter, and also, unless the bore is large enough to admit the hand, it is sometimes impossible to gauge the bottom end of a blind hole at all. A 12-in. power-hacksaw blade, ground to shape, makes an excellent caliper leg, and can be attached to a scale of the same length in the manner illustrated by the drawing.

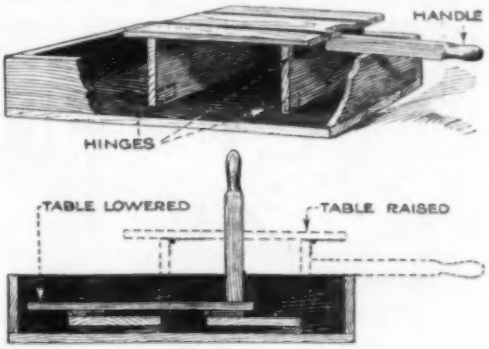


Bend a piece of ⅛-in. flat steel, and drill one side for a tight-fitting pin, which projects inside and serves as a pivot for the saw-blade leg. A hole is drilled and tapped on the opposite side for a knurled screw with which the attachment is clamped to the scale.

The caliper is set to the proper dimension by means of another scale, and as the leg is opened the holder is pushed forward to keep the caliper point in line with the end of the scale. In use, the tool is pushed into the bore, with the scale held firmly against one side of the hole. Any variation in size can then be felt immediately as the caliper is moved forward. In addition to being handy for long holes of medium diameter, the tool is also useful for larger holes of short length which must be perfectly straight.

Dipping Tank for Brick and Tile

In the laying of face brick and some forms of ornamental tile, it is necessary that the materials be soaked in water or other fluid so that the cement will adhere to them. In such cases, the dipping tank illustrated is a most convenient accessory. The tile or brick is placed on a horizontal platform, which is hinged to two parallel supports, the latter being fastened to the bottom of the tank with hinges. A handle is attached to one of the endpieces, for raising or lowering the material into the solution. This enables the worker to do the work rapidly without placing his hands in the bath.



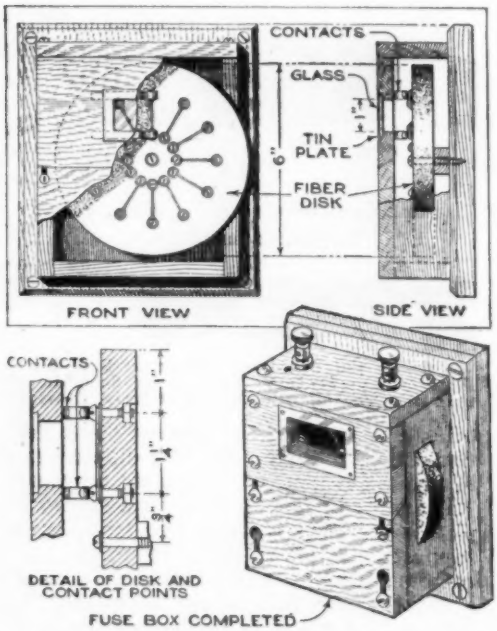
Tile Setters and Bricklayers Who must Soak Certain Kinds of Materials in Water or Other Solutions, will Find the Dipping Vat Illustrated Very Convenient

Underground Garbage-Can Receiver

A convenient and inexpensive garbage-can container is easily made from a section of glazed sewer tile, as shown in the drawing. This arrangement conceals the garbage receptacle under the surface of the ground. A section of tile, large enough to receive the can, is set into a pit dug in the ground so that the shoulder end is just flush with the surface. A mixture of sand and cement is poured into the bottom, to a depth of several inches, so that the container can be easily kept clean. A wooden cover, which fits neatly into the shoulder of the tile, is provided to keep flies and animals from the refuse.

A Multiple Fuse Block

A multiple fuse block is a very handy thing to have in the workshop or experimental laboratory, because, when a



A Fuse Block That Enables a New Fuse to be Put into an Electrical Circuit, to Take the Place of One That has Blown, by the Mere Turn of a Fiber Disk

fuse is blown, a new one can be brought into the circuit by the mere turn of a disk.

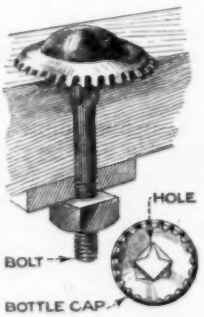
Cut out a 6-in. disk from ½-in. fiber and drill 12 equally spaced holes on a circle 2 in. from the center. Then drill 12 more holes, on a 4-in. circle, in such a manner that the holes in the outer circle will be in a radial line with those on the inner one. Obtain 24 small brass machine screws, ⅜ in. long, with brass nuts and washers to fit. Counterbore the holes on one side of the disk to a depth of ¼ in., with a drill slightly smaller in diameter than the width of the nuts across their corners, and drive the nuts into the counterbores with a flat-ended stick. If the nuts do not fit tightly, small wooden plugs should be driven in around them to hold them in place. Place a washer on each machine screw, and screw them into the nuts from the opposite side of the disk.

Build a case, as shown, a slot being cut in one side so that the edge of the disk will protrude, and mount the disk as indicated. The screw used as a bearing should be fairly large, in order to present a large wearing surface; a washer should be placed under the screw head and the screw tightened just enough to make the disk turn stiffly. The cover for the case should be made in two pieces. The upper part is permanently fastened to the case, while the lower section is fastened in such a manner that, by slightly loosening the screws, it can be quickly removed. The object of making half of the cover removable is to make possible reloading of the fuses on the disk. A slot is made in the upper part of the case, and recessed so that the small light of glass used will come flush with the surface; a piece of tin or brass, cut to the shape shown, is fastened over the glass with brads to hold the glass in place. Two brass fingers are cut and shaped as in the drawing; these are mounted on the inside of the upper half of the cover, in such a manner that they will coincide and make contact with the two brass screws of one fuse wire. Wires are led from these fingers to binding posts on the top of the case or any other convenient position.

To load the fuse disk, remove the lower cover, loosen the machine screws, and place lengths of standard fuse wire under the screw heads; then tighten the screws. After loading the disk, the cover is replaced, and the disk is turned by its protruding edge until a fuse wire appears immediately behind the glass window. The fuse that appears through the window is the one in the circuit, and if it blows out, it is a simple matter to turn the disk until another fuse is in place.—I. B. Jackson, Lafayette, Ind.

Bottle Cap Prevents Bolt from Turning

While a man was repairing some of the body irons of a wagon, he found that the holes had become enlarged so that it was hardly possible to prevent the bolts from turning while tightening the nuts. In order to prevent this, the simple method illustrated was successfully used. Square holes were punched through the centers of crown bottle caps; the bolts were driven through the punched holes and the nuts tightened, drawing the corrugated edges of the caps into the wood, and thus anchoring the heads of the bolts securely.



Forms for Concrete Gateposts

The drawings illustrate two designs of concrete gateposts that can be made from easily constructed forms; the latter are put together on the job, and may be used repeatedly.

The style illustrated in Fig. 1 is about the simplest it is possible to build, but the severity of a plain post is relieved by the grooves, which are formed by cleats nailed to the four faces of the form. For either of these types, a footing is sunk 3½ ft. below grade, using alternate layers of field stone and concrete, mixed in the proportion of 1 part cement, 2 parts sand, and 4 parts crushed stone or gravel. Very heavy iron rods are imbedded in the footing with their ends projecting above the ground to serve as an anchorage for the posts. The face forms are made of ⅞-in. pine or spruce, and are crossed at intervals by ½-in. cleats of dressed pine. The front and back faces of the forms should lap the sides, and, when finished, the inside surfaces of all four pieces should be painted with dropblack, which, when dry, is coated with shellac. When set up, the forms should be held together by bolt

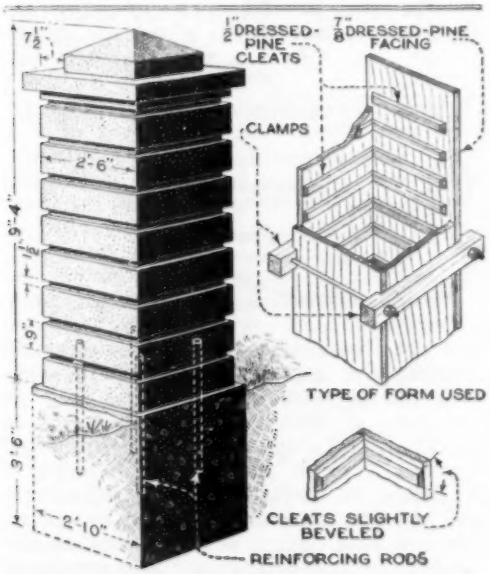


Fig. 1

Simplest Type of Gatepost and Form: Note the Reinforcing Rods Extending into the Footing

clamps, spaced vertically at intervals of about 2 ft. The pyramidal tops of the posts are trowel-finished.

In general, the construction of the type illustrated in Fig. 2 is the same as the other except that it is paneled. If a light is desired, center the pipe or conduit, and allow plenty of the thread to project above the form, for attaching the lighting fixture, before the concrete mixture is poured. In all cases, the forms should be plumb, securely braced, and tight, so that no cement will run out with

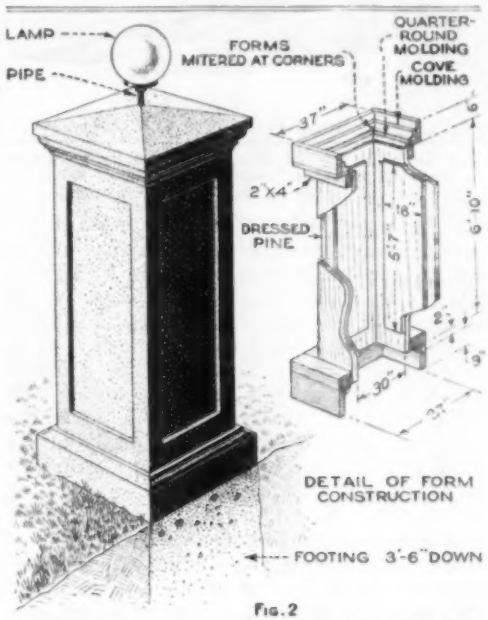


Fig. 2

Form Construction for Paneled Type of Gatepost: The Pipe or Conduit for a Lamp may be Cast in Place and the Top Finished with the Trowel

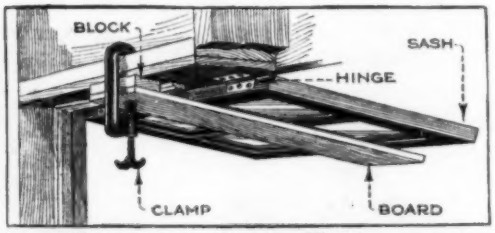
the water and leave unsightly voids on the outside surfaces.

The cement mixture used for both posts should consist of about 1 part cement, 2 parts sand, and 3 parts of fine aggregate, either in the form of crushed stone or gravel. By using white cement, white sand, and white stone or gravel, a practically pure-white effect is obtained instead of the usually objectionable tone of gray or brown. The concrete should be poured into the forms a little at a time, and should be thoroughly rammed so that it will come into contact with all parts of the mold and fill all corners completely. For convenience in removing the forms, the edges of the cleats and panels should be beveled slightly. The bevel shown on the cleats in Fig. 1 is exaggerated so as to illustrate it better.

¶ To fit sheet metal over rivets, hammer the metal over the rivets with a short piece of iron pipe of a diameter suited to the rivets used.

Hanging Hinged Window Frame from Inside

When a window is to be hung so that it will swing outward, the hinges being



The Difficult Job of Hanging Windows to Swing Outward can be Easily Accomplished Single-Handed by Using the Method Illustrated

on the upper edge of the frame, and the work cannot be reached from the outside by ladder or otherwise, it is a difficult matter to attach the hinges properly. A method of doing this consists in first screwing the hinges to the window sash, after which the position of the holes is carefully transferred onto the upper part of the frame, and holes drilled for the screws. Then take a 1 by 6-in. plank, a little longer than the sash, and clamp this to the upper part of the window opening so that the board projects outward with a slight downward angle. This form of window is often hung in rough construction, or buildings that have not been finished inside, in which case it is an easy matter to get the clamp over the framing. If the inside is finished, the plank can be temporarily nailed in place. Next lift the window sash onto the plank and balance it there, and ease off on the clamp or lower the plank if necessary, until the hinges will lift into place and register with the drilled holes. One man can hang windows of this kind by this method.

Preventing Steel Straightedge from Slipping

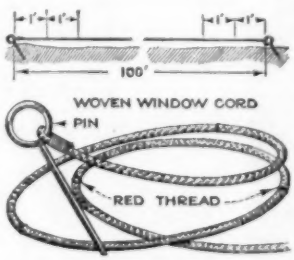
A surveyor in the field found that he had been provided with a large drawing board, straightedges, and triangle, but that none of the boards was smooth enough to use a T-square with, even had there been one at hand. It was therefore necessary to use a steel straightedge, but it was found that strips of adhesive tape, applied to the underside, would not provide sufficient friction to prevent the instrument from sliding down the inclined drawing board. It was also discovered, however, that the adhesive tape was the only thing that would stick to the steel, and, in order to obtain the necessary friction, strips of ordinary table oilcloth were glued to the adhesive tape with liquid glue. Under ordinary conditions glue will not adhere to steel for any length of time, so that it is necessary, in cases of this kind, to apply the adhesive strips first and then glue the oilcloth, with the coated, or smooth, side out, to the tape.—H. E. Balfour, Ottawa, Canada.

Surveyor's Tape Made of Rope

In surveying a piece of land where extreme accuracy is not a requisite, one man can do the job when the tape shown in the drawing is used.

Take a 100-ft. length of window-sash cord, and serve the ends of it around a couple of pins so that the bodies of the pins will be exactly 100 ft. apart. Measure off 10 ft. from one pin and wrap with colored thread, red preferably, as being easiest to see on the ground; continue this for the length of the cord so that it is divided into ten 10-ft. sections. Divide the 10-ft. sections at each end into ten equal sections of 1 ft. each.

To measure distances of less than 100 ft. it is necessary to set the tape on the nearest 10-ft. mark, and measure in feet at the end of the cord, guessing the inches, just as with the steel tape, except that one sets on a 10-ft. section instead of a 1-ft. division. It is impractical to mark the inches on the cord with anything except ink, which does not show well when the tape is wet. In starting the measurement, push the pin into the ground, inclining it a little in the same direction as the measure is to be taken, and carry the other end out 100 ft.; stick in the second pin, inclining it in the same direction as the other and pull the first one loose. If the line to be run is a long one, it is well to set up the range pole at 100 ft. from the instrument, so as to have something to aline with. Reverse the end of the tape and continue until the desired distance is reached, measuring the final distance in the manner described above.

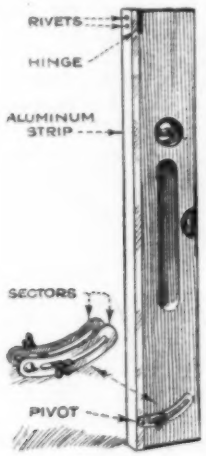


To get exactly on the line, pull the tape across it as nearly at right angles to the traverse as possible, and at sufficient

height to see it with the instrument, placing the middle of one of the 10-ft. sections at one end across where the line should run, as nearly as can be judged with the eye; then go back to the instrument and read the position on the tape at which the stake should be placed.—B. F. Leeper, Chickasaw, Ala.

Level for Tapered Masonry

Anyone acquainted with the operation of laying brick masonry is more or less familiar with the makeshifts used by the masons in fixing up their levels for tapered walls or chimneys. Usually a strip of wood that will give the proper taper for the work at hand is nailed to the edge of the level, and often there are no facilities in the field for cutting such a strip with any degree of accuracy. The drawing shows a very simple and practical attachment which forms a permanent part of the level, and can be fitted with very little trouble to any standard instrument. A strip of aluminum, or other light metal, is hinged to the upper end of the level, and at the other end is pivoted to a pair of slotted sectors, clamped against the side of the instrument with a thumbscrew. It will be seen at once how easy it is to set the attachment for any taper. There are many reasons why this attachment is a decided improvement, the chief among them being that time is saved; economy is another consideration, as a good level is soon ruined by constant nailing.

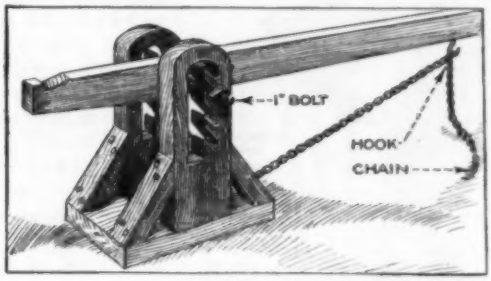


A Kink for Draftsmen

Those who have had little experience in detailing machine parts where very irregular curves are a part of their make-up, will find the following hint helpful. Place the article to be drawn on a sheet of paper on a flat surface with a light suspended directly above the center line of the object. A shadow will be cast by the light which can be pointed off easily with a pencil at intervals of about ¼ in. This idea is particularly effective when rapid work is required.

A Quick-Acting Jack

The jack shown in the drawing is particularly useful in a garage or service station because of the time saved in jacking

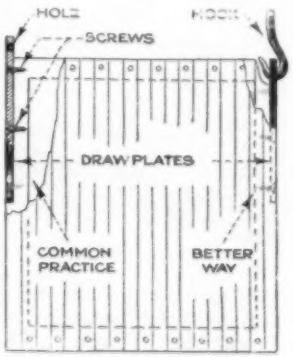


A Jack for Service Station or Garage, Which Makes the Raising of the Front or Rear of a Car a Matter of Seconds

up the front or rear of a car. The details of construction will be apparent at a glance. The long wooden lever is adjustable to different heights by altering the position of its pivot in the notches. A chain and hook are provided for holding the load when raised from the floor.—Theodore E. Landry, Baton Rouge, La.

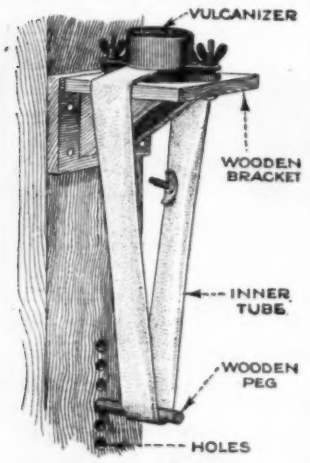
Fastening Drawplates on Patterns

When locating and fastening drawplates on deep-lift patterns, the usual practice is to allow them to extend beyond the flat, or cope, face of the pattern. When rammed up on a bottom board, these extending drawplates prevent the molder from laying the pattern flat on the mold or bottom board; this trouble is often overcome by cutting holes in the bottom board to take the projections, or by removing the plates. A better way of attaching drawplates to the patterns is shown in the drawing, this arrangement making it unnecessary to remove the plates or cut holes in the bottom boards. The end of the plate is brought flush with the cope face, and a recess is gouged out of the pattern just back of the eye, to allow the hooks to be placed in the holes.—M. E. Duggan, Kenosha, Wis.



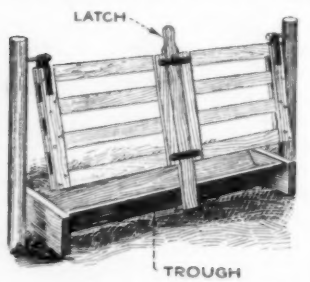
Vulcanizing Inner Tubes

A method of repairing inner tubes is shown in the drawing that is worth adopting because of the speed with which the work can be roughened, the patch applied, and vulcanization completed. The base of the vulcanizer is screwed or bolted to a wooden bracket at a convenient height. Under the bracket a series of holes is drilled so that any tube can be stretched taut by inserting a wooden peg in one of the holes. With the puncture placed uppermost on the bracket and the tube stretched taut, the roughing of the work and the other operations can be done easily, leaving both hands free.



Improved Swill Trough for Swine

"Swilling" hogs in troughs is not a very pleasant task, as the animals climb into the trough and make it inconvenient to empty the feed from buckets. A swineherd has adopted the original idea shown in the drawing, which does away with the annoyance. A gate, made like an ordinary gate, but fitted with a vertical latch, is suspended between two posts directly above the trough. The hinges, which consist simply of pins and iron straps, are placed at the upper corners so that the gate is free to swing either backward or forward at the bottom. When feeding time comes, the gate is pushed forward and the latch dropped; this holds the gate in place and keeps the hogs from the trough until it has been filled from the other side, when the latch is withdrawn, allowing the gate to swing free.

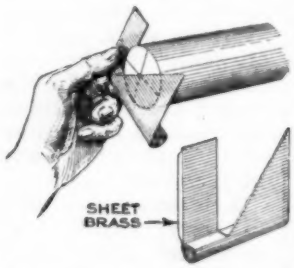


Asbestos Dams for Babbitting

Clay and putty are the materials commonly used for damming the ends of a bearing which is being babbitted. Finely ground magnesia or asbestos are better, however, as they will not dry out or soften under heat like clay or putty. The material is brought to the proper consistency by mixing it with heavy cylinder oil; it can be used several times.

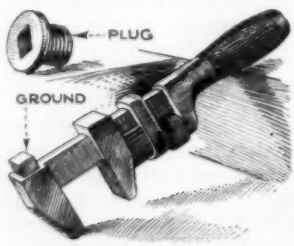
Centering Round Stock

Easily formed from a piece of sheet brass, the little device shown in the drawing has been satisfactorily used for locating the center on cylindrical work that is to be turned, drilled, or otherwise machined. In use, the device is placed on the end of the piece to be centered, the perpendicular part being held closely against the work, and a line is scribed with a sharp point along the 45° edge. Then the device is turned about one-fourth of the way around the work and another line scribed. The intersection of the lines will be the center of the work. However, as a check for accuracy, three or more lines should be scribed across the end.—C. D. Cheney, Lyndhurst, N. J.



Wrench for Plugs

The owner of a farm has a tractor on which removable plugs are used in the axle housing, gas tank, and other parts. This type of plug has a square hole at the center, into which a square wrench or key must be inserted. To avoid the delay incident to searching for the regular wrench, which was usually missing when most needed, an ordinary monkey wrench was adapted for the removal of the plugs, as shown, by grinding down the back of the stationary jaw to fit the square hole.



How to Make a Selenium Cell

By THOMAS P. BENSON

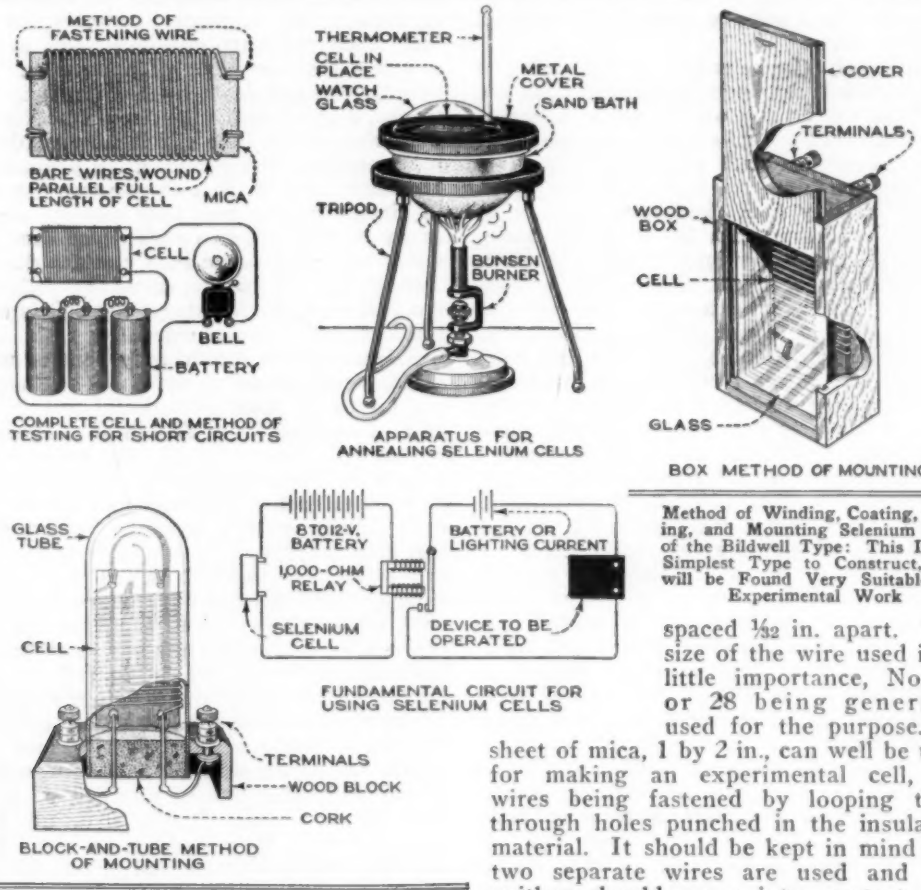
EXISTING demands for a sensitive, reliable selenium cell that can be produced in quantities have not been met in any sense. The development of such a cell opens interesting possibilities to the experimenter and inventor.

There are many types of light-sensitive or photoelectric cells that make use of various substances, such as thallium, barium, or the alkaline metals; the construction of these, however, requires elaborate apparatus, while selenium cells are simple, and comparatively easy to make.

As to selenium itself, it is an element that resembles sulphur in its chemical reactions and occurs in three well-defined forms—amorphous, vitreous, and metallic. Only the metallic form is of value for selenium-cell construction. In this form it is an opaque, black, glossy mass, and a poor conductor of electricity in the dark. It is well to note, at this point, that the mere connection of a stick of selenium into a circuit with a relay will not give results, as it must receive special treatment before it will actuate a relay.

A selenium cell consists essentially of two conductors, spaced a short distance apart, with a thin film of selenium forming a bridge between them. The Bildwell type of cell, described in this article and shown in the drawing, is the simplest form for the amateur to make. Two bare wires of copper, brass, or platinum are wound on a heat-resisting form of mica, slate, glass, or porcelain, the wires being spaced 1/32 in. apart. The size of the wire used is of little importance, No. 26 or 28 being generally used for the purpose. A sheet of mica, 1 by 2 in., can well be used for making an experimental cell, the wires being fastened by looping them through holes punched in the insulating material. It should be kept in mind that two separate wires are used and that neither should come into contact with the other at any point. After the wires have been wound onto the mica, or whatever is used for the insulation, the cell at this stage is tested for short circuits by means of a battery and bell, as in the drawing. If the bell rings, the wires touch at some point and must be separated.

Having proved that no short circuit ex-



Method of Winding, Coating, Testing, and Mounting Selenium Cells of the Bildwell Type: This Is the Simplest Type to Construct, and will be Found Very Suitable for Experimental Work

ists in the winding, the cell is ready for the selenium to be applied. To do this properly, the following apparatus is necessary: a tripod, a Bunsen burner, a sand bath with cover, and a chemical thermometer reading to 225° C. (437° F.). A hole is drilled in the cover of the sand bath to admit the thermometer as in the drawing, which shows the assembly.

The selenium should be bought from a reliable chemical-supply house. Specifying "electrolytic selenium" will insure that chemically pure material is obtained, instead of the commercial grade, which is often sold for cell work, but is entirely unsuited to the purpose. The selenium comes in round sticks, about ¼ in. in diameter, and has the appearance of black sealing wax.

To apply the selenium to the cell, the apparatus is set up in the manner shown, and the cell is laid on the metal cover of the sand bath. Light the burner and heat the cell until a stick of the selenium will melt when the cell is touched with it. Then quickly coat the entire surface of the cell with a thin layer of selenium, smoothing out any lumps that may form with a strip of mica. To obtain a satisfactory coating, the temperature must be maintained at about 220° C. (428° F.), when the selenium is in a semifluid condition. At lower temperatures the selenium turns gray and hard and cannot be spread properly without raising the temperature. On the other hand, a temperature in excess of that given will cause the selenium to collect in balls, like mercury.

When a smooth, even surface has been obtained, remove the cell and allow it to cool, turning down the Bunsen burner until the temperature of the sand bath has dropped to about 120° C. (248° F.). The cell is then replaced on the sand bath and allowed to heat slowly. Within a short time the surface of the cell will take on a gray color, which is caused by the crystallization of the selenium. Increase the temperature slowly and watch carefully for the first sign of melting, which is indicated by the selenium turning black around the edges. At the first sign of melting, remove the cell quickly, turn down the burner a trifle, and replace the cell. Continue to watch it for signs of melting; should none appear, it is covered with a watch glass and left alone for three hours. Should the selenium show signs of melting a second time, the cell is again removed, allowed to recrystallize, and replaced on the sand bath after the flame has been turned still lower, the idea being to hold the temperature just below the melting point of the material, for, should it melt during the process, it will be necessary to begin all over again. Care in this annealing operation will prevent a waste of much time.

When the three-hour annealing period is up, the flame is lowered by small degrees over a period of an hour, and then finally turned out entirely. The sand bath and cell are then covered with a heavy cloth and allowed to cool slowly.

When completely cooled, the cell is finished and ready for mounting and testing. Either of the methods of mounting shown in the drawing may be used. The box method is perhaps the simpler and easier; that with the cell inclosed in a glass tube is neater, protects the device from moisture and dust, and makes a better-looking piece of apparatus. To protect the cell from light when it is not in use, a cardboard tube should be slipped over the glass. The cell is now ready to be tested for its light-sensitive properties. It would be well first to connect the cell in circuit with a bell and battery, as already mentioned, and make sure that the wires have not come into contact during the application of the selenium. Should the bell ring, at this stage, the cell is useless and must be discarded.

Selenium cells should only be used with a high-resistance relay. Get a relay, wound to at least 500 ohms' resistance, and three or four flashlight batteries, which will give about 12 volts when connected in series. Connect the cell, batteries, and relay in series, as shown in the diagram, with a separate battery and bell connected to the relay-contact binding posts, to indicate when the relay closes. With the cell covered, or in darkness, adjust the relay so that the flow of current is not quite strong enough to close it. Now allow light to fall on the cell, when the relay should close sharply. Reduce the voltage slightly by cutting out one or more of the batteries, and readjust the relay until it will give quick action with the fewest number of batteries in the circuit. It will be found that selenium cells vary greatly in their resistance, and each one will require individual testing to determine the proper voltage to use.

The action of the selenium cell is more or less understood; in the dark it has a very high resistance and will permit but a small current to flow. On allowing light to fall on it, the resistance drops to from one-half to one-quarter of its "dark" value, and more current flows, thus closing the relay. The higher the resistance

of the relay used, the more satisfactory the results will be; a 1,000-ohm polarized relay is the best for the purpose.

It is not within the scope of this article to describe in detail the application of selenium cells. They may be used for any purpose where light is desired to be the controlling agent. Thus, they can be used as a sunrise alarm, the rising sun acting on the cell to control any desired apparatus. As a burglar alarm the intruder's flashlight serves to operate the apparatus; garage doors can be arranged to open automatically when the headlights of the car flash on the cell. There are many other applications for selenium cells that are interesting and instructive; for example, a secret lock on a door can be made so that anyone familiar with the arrangement may open it by striking a match and holding it before the keyhole, thus affecting a cell mounted in line with the aperture and controlling an electric lock. The number of applications is limited only by the constructor's ingenuity, but a few precautions should be observed in the care and use of the cell.

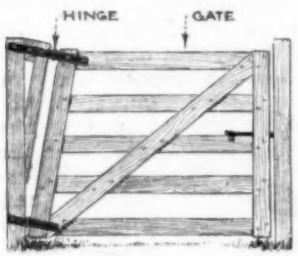
Do not overheat it by passing too strong a current through it, and keep it protected from dust and moisture. When not in use, the selenium cell should be kept in the dark, because long exposure to light fatigues it, and it loses its sensitiveness temporarily. A daily exposure to light for a short period, however, seems to mature and improve it.

Electroplating Stainless Steel

It has been found that stainless steel is unaffected by many plating solutions that are successful when used with ordinary steels. Even the usual copper solution with which steel is coated as a preparation for other deposits, fails to make a successful job of plating the new metal. Direct nickelplating also fails with stainless steel. The most satisfactory coating for this metal has been found to be zinc deposited from a cyanide-of-zinc solution.

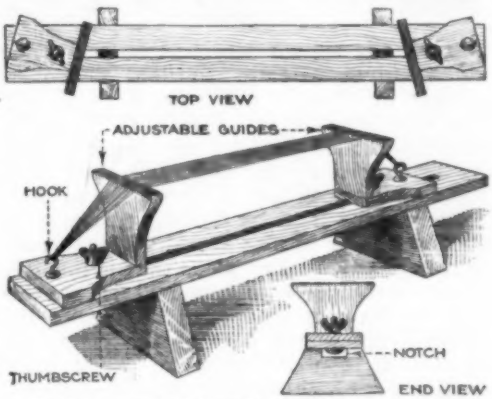
A Self-Closing Gate

Instead of the cumbersome chain and weight generally used to keep gates to the garden and poultry inclosure shut, the arrangement shown in the drawing may be used. It is neat in construction, and will always swing the gate shut when released. In making a gate of this type, the width of the top should be made about 6 in. less than the bottom, and either the post to which it is fastened should be inclined at the same angle or an extra piece nailed to the post, parallel with the side of the gate. When the gate is hinged as shown, it will swing upward at the outer corner so that, when released, it will instantly shut. The hinges should always be put on at right angles to the sloping pieces.—H. F. Grinstead, Columbia, Mo.



An Improved Loom for Beadwork

Devotees to woven beadwork will be quick to appreciate the advantages provided by the adjustable loom illustrated.

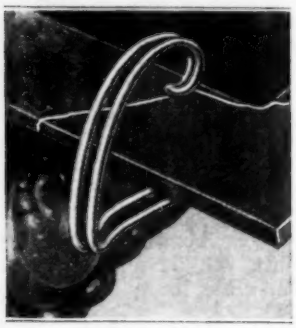


A Bead Loom with Adjustable Guides for the Advanced Worker: The Guides can be Moved Independently of Each Other

This loom does not differ in general appearance from the common type, except that the guides are adjustable. There is a slot through the center of the base which extends to within a short distance of each end and serves as a guide for the thumbscrews that clamp the guides to the base. The guides are made separate from the base and can be placed at any distance apart on the base or set at any angle. Two small brass hooks are provided on the guides, as shown, for drawing up the threads. The small notches in the top of the guides are placed 1/16 in. apart, and every or every other one may be used, according to the kind of work being done.—Oslar B. Walker, Columbus, Ohio.

Spring Clamp for Acetylene Welding

A large part of the jobbing welder's time is spent in the repairing of cast-iron articles of medium or light thickness, the ends and corners of such articles frequently becoming broken off. Before these broken pieces can be welded together, they must, of course, be lined up, and this operation takes more time than the actual welding itself, if the usual method of packing with various odds and ends is followed. A spring clamp that will hold the broken piece in position while it is "tack"-welded, can be made in a few minutes from a piece of steel wire. In the illustration such a clamp is shown attached to the front of a stove casting, to hold a broken corner in place. The steel wire is not hardened, the natural spring of the metal being sufficient to hold the pieces; also, by leaving the wire soft, the ends that pass underneath and support the broken piece can be bent as desired to conform to the shape of the work. This clamp will hold any broken piece that is not too heavy, provided the top end is pushed over onto the main part of the work. By making the upper part of the clamp as shown, it can be used on work with beaded edges, shoulders, etc. The clamp is not left in place all the time the weld is being made; it is merely used to hold the parts in place for tack-welding at either end, after which it is removed.



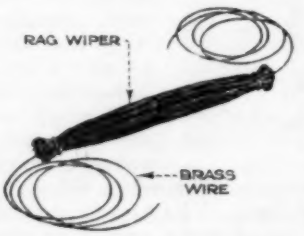
Refinishing Brass Beds and Lighting Fixtures

Brass beds and lighting fixtures are given a coat of lacquer in order to protect the polished surface as long as possible, and prevent it from turning black. During the annual housecleaning period all such brass work is usually polished, with the result that the lacquer is rubbed off in spots, leaving unsightly patches that contrast sharply with the lacquered portions. Fixtures in a kitchen will turn black quicker than those elsewhere in the house, as smoke, steam, and grease cause the protecting varnish to fail. In order to restore their original luster, it is necessary to remove all the old finish; this can be done by rubbing with a rag saturated with alcohol. Should the alcohol fail to remove the lacquer, it is an indication that the latter is made with a turpentine base, in which case turpentine instead of alcohol should be used. Next get a good metal polish, and go over all brass work thoroughly until it has the desired polish. Wipe off every trace of the polish, using clean rags so as not to leave any grease, which would prevent the lacquer from sticking. Then put on a coat of the lacquer and allow it to dry. Lacquer can be bought at most paint stores, but if it is unobtainable, it can be made after the following formula: Dissolve 3 oz. gum mastic in 1 pt. of turpentine by shaking. After dissolving the gum, strain the liquid through a piece of clean cheesecloth. As the density of the mastic varies somewhat, it may be necessary to add a little more than the quantity given; the idea is to make it thick enough to flow easily under a common varnish brush. If a more golden finish is wanted, add ¼ dr. of turmeric and also ¼ dr. of gamboge. Three coats of the lacquer should be applied, and each should be thoroughly dry before the next is put on. This varnish may be cleaned with a soft sponge and white soap and water.

For gas and electric fixtures in the kitchen there is nothing better than a coating of clear yellow spar varnish, containing Chinese wood-nut oil; such varnish, besides being flexible, will withstand the effects of steam and grease. It will last longer than the lacquer.

Cleaning Auto Oil-Feed Pipe

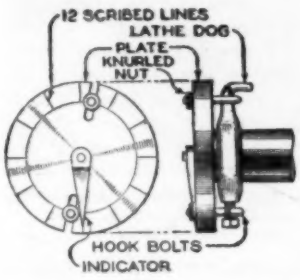
When the oil-feed pipe of an automobile engine becomes clogged, the usual cleaning method consists in blowing air under pressure through it, or passing a wire into it in an effort to clear the obstruction. In the course of time, however, the oil deposits a film of waxy or gummy substance in the tube, and the methods described can only be depended upon to remove solid obstructions, leaving much of the dirt sticking to the inner surface of the pipe. A better one is used by an automo-



bile-service station to clean the oil-feed pipes of its customers' cars thoroughly. A piece of brass wire is looped around the ends of a piece of rag; the wire is passed through the pipe, pulling the rag swab along with it, and as both ends of the wire project from the feed pipe, the swab can be worked back and forth until all foreign matter is removed.

Indicator for Shaper or Drill Press

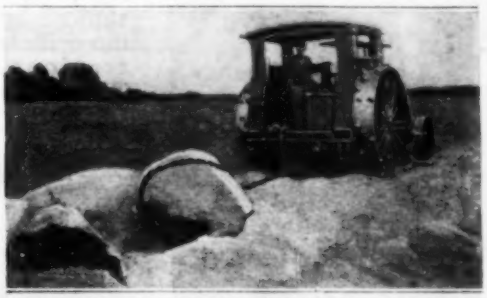
Very often the lack of a simple indicating device has caused hours of extra work on a shaper or drill press, when shafts, or other round work, are being splined, keyseated, or otherwise machined. The indicating plate illustrated can be attached to the end of stock of any diameter that has a center hole, and will be found very convenient for accurately dividing it. The plate is 8 in. in diameter and ⅝ in. thick, with a ⅝-in. reamed hole in the center. Twelve equally spaced radial lines are scribed on one side, and two slots are cut at opposite points on the circumference, as shown; hook bolts, fitted with knurled nuts, are used in these slots. Fitting snugly in the reamed hole in the center is a pin having one end pointed to fit the center in the work, and the other end tapered. An indicating piece is made from flat stock, one end being drilled to fit the tapered pin easily, and the other end pointed. To hold the plate in position, a lathe dog is tightened on the shaft, then the plate is held against the end of the work with the pin in the center hole. The hook bolts are placed over the dog, the knurled nuts tightened lightly, and the plate is swung around until the pointer coincides with one of the lines, when the nuts are drawn tight. If it is desired to work on the shaft at, say, six different positions, the shaft is loosened in the vise or V-blocks, and revolved until the pointer, which hangs in a vertical position, coincides in turn with every other line on the plate.



¶Oxygen and acetylene tanks should never be handled by crane, either magnetic or mechanical.

Dragging Bowlders with a Tractor

When moving large rocks from a field, attention should be paid to the manner in which the hitch is made. The chain

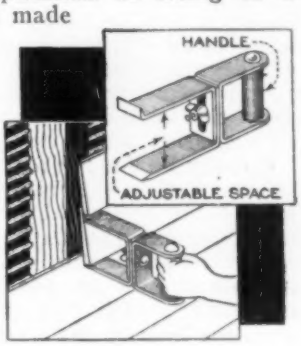


Pulling Heavy Bowlders with a Tractor, Illustrating How the Hitch should be Made in Order to Enable the Tractor to Pull the Load Easily

or cable used should be fastened to the load as close to the ground as possible. Thus, when power is applied, the pull will be away from the ground rather than along it, or—worse—against it. In the illustration, the hitch is made in the proper manner, but the pull might be made even lighter by attaching the tractor end of the chain a little higher. Another important factor is the length of the chain. If possible, not more than 3 or 4 ft. of it should extend between the tractor and the rock. The closer the two are, the greater will be the angle of pull, and the less the draft necessary.

A Handy Siding Gauge

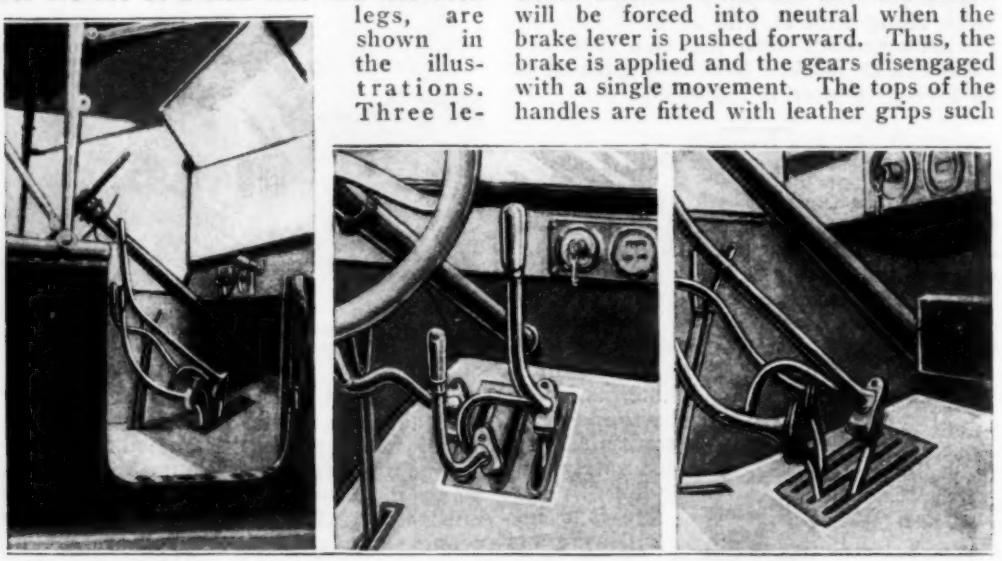
A gauge that will save a great deal of time in the application of siding to a building can be made from three pieces of flat iron. It consists of three pieces of iron, with a rivet bolt and wingnut. The iron pieces are formed and the tool assembled as in the drawing.



With one end of the siding temporarily tacked to the studding or sheathing, the other end is accurately spaced by means of the gauge, applied as illustrated, and the nail driven home. Before the last blow is struck, the gauge may be slid along to the next point to be nailed.

Automobile-Control Pedals Operated by Hand

The controls of a light automobile, fitted for the use of a man who had lost both legs, are shown in the illustrations. Three levers are welded to the pedal pads of the clutch, reverse and brake pedals, the levers being of such length that they are within easy reach of the driver. A fourth rod is welded at right angles to the brake pedal, and carried over to the clutch in such a manner that the clutch will be forced into neutral when the brake lever is pushed forward. Thus, the brake is applied and the gears disengaged with a single movement. The tops of the handles are fitted with leather grips such as used on the handlebars of a bicycle.—G. K. Bowman, Columbus, Ohio.



Extensions to Pedal Controls of an Auto That Enable a Cripple to Drive His Car. Left: General View of the Pedal Extensions. Center and Right: Method of Connecting the Brake and Clutch Levers So That the Clutch is Thrown into Neutral by a Forward Movement of the Brake Handle

Testing Penetration of Wood Preservatives

The effectiveness of any wood-preservation treatment is measured very largely by the depth to which the preservative penetrates. The presence of creosote oil is indicated by the dark discoloration, and the degree of penetration may be readily found by taking a sample at a point free from checks and other imperfections and at a considerable distance from the end. This may be done with an ordinary ½-in. bit, or with an increment borer, which brings out a core of wood, showing in cross section the depth of penetration. The observation should be made at once, because the oil spreads rapidly over the cut surface. In order to prevent infection, the hole in the treated piece should be tightly closed with a creosoted plug.

Zinc chloride, on the other hand, is colorless, and the depth of penetration of this preservative must be found by chemical means. After cutting the stick in two, or obtaining a sample by means of the increment borer, the freshly cut surface is dipped for not over 10 seconds in a 1-per-cent solution of potassium ferrocyanide, and the excess solution is removed by blotting paper. The sample is then dipped in a 1-per-cent solution of uranium acetate and dried. The treated portions will be whiter than the natural wood, and those untreated will have a dark-red or maroon color. This method does not give very sharp contrast on wood which is reddish in color, like red oak, but is otherwise very satisfactory.

Another method consists in spraying over the freshly cut surface a mixture of equal parts of a 1-per-cent potassium-ferricyanide solution, a 1-per-cent potassium-iodide solution, and a 5-per-cent solution of soluble starch. This mixture colors the treated portion a very dark blue but does not affect the untreated wood. Although the color fades in time, it may be brought back by spraying again.

Sodium fluoride is also a colorless preservative, but no satisfactory method for showing its presence in wood has been devised. Mercuric chloride, which is another colorless preservative, turns black when dipped in a solution of hydrogen sulphide.

Amateur Mechanics
Information as to where to obtain any specified materials or parts for making objects described in the following pages may be had, on request, from our Bureau of Information.—Editor.

Motor Wheel Serves as Home-Shop Power Plant

By L. B. ROBBINS

A POWER PLANT that will operate small drills, grinding wheels, lathes, and similar machines, in the home workshop, can be readily made from one of the popular motor wheels, in the manner shown in the illustrations. When the bicycle is laid up for the winter, the wheel can be taken off and used in the shop.

First, choose the location best suited for the installation; this should be an overhead beam or joist running at right angles to the bench. Set the machine to be operated on a bench, so that it will not interfere with other work, and then locate the motor wheel back of the center line of the machine, if possible, so that the belt will run at an angle. The motor wheel is suspended from the ceiling by a flat-iron hanger; this should be long enough so that, when it is fastened to the beam and the motor attached, there will be at least 15 in. between the top of the tank and the ceiling. This arrangement provides room for filling the tank with fuel. One of the hanger legs is a straight piece of iron, while the other is offset so that the bottom ends are 12 in. apart. Drill three holes in the top of the legs and one ½-in. hole an inch from the bottom of each; the latter is for the pivot bolt. Attach the legs to opposite sides of the overhead beam or joist with bolts or lagscrews, and make sure that the pivot holes are exactly in line with each other. Then drill a smaller hole in the straight leg, 15 or 16 in. above the pivot hole, and bolt a diagonal iron brace to it and the beam—it may be found necessary to use two such braces, and one between the legs, as shown, to keep them rigid and perpendicular.

Place the end of the motor wheel that attaches to the bicycle between the legs, and pivot it to them with a bolt made from a piece of ½-in. round iron rod, threaded at both ends and provided with nuts and washers. Set a piece of pipe over the bolt to serve as a spacer; this should be long enough to keep the motor wheel bearing against the straight leg.

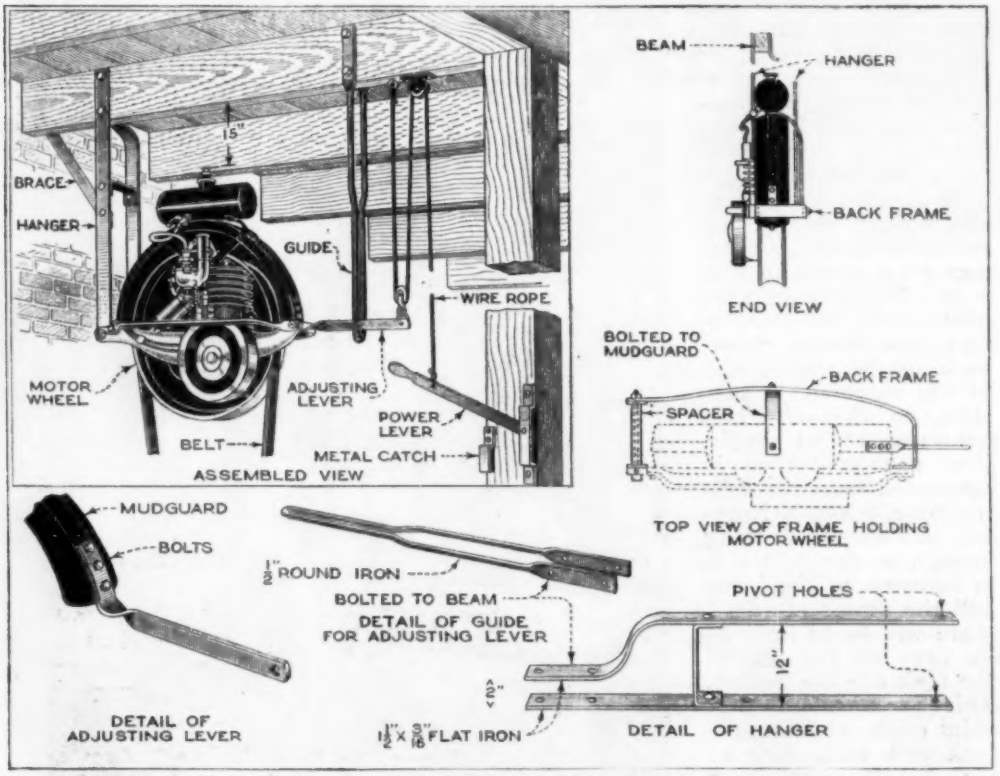
A Motor Wheel, Detached from the Bicycle When the Summer Is Over, and Installed above the Bench, Provides a Small Power Plant for Driving the Tools in the Home Workshop

Drill two or three small holes in the rear end of the mudguard and bolt on the

adjusting lever shown in the drawing. This lever is made from a piece of heavy iron, twisted at one end and curved to fit the mudguard. Holes should be drilled in the iron to correspond with those drilled in the guard, in addition to a hole in the end for the pull wire.

Next, a guide is made from a piece of round rod, the ends of this being flattened, and bolted to the beam directly over the adjusting lever. With the motor wheel blocked horizontally, adjust the guide so that the bottom will be about 3 or 4 in. below the adjusting lever. Forge the sides of the guide together, so that they just allow the lever to slide easily between them without undue play. and under the metal catch shown, the motor will be raised about 3 in. above the bottom of the guide.

Lastly, make a back frame of flat iron. This should be bolted to the bent leg of the hanger at the pivot hole, and to the end of the motor wheel below the adjusting lever. This is done by removing the bolt that binds the engine crankcase to the motor guard, slipping the iron against them, and bolting all three together with a longer bolt. Then bolt a properly bent piece of flat iron onto the middle of this back frame, at right angles to it, and bolt or rivet the end to the mudguard underneath the fuel tank; this forms a rigid frame and keeps the motor wheel vertical



Insert: The Complete Assembly. Upper Right: End and Plan Views of Back Frame and Brace. Lower Left: Detail of Adjusting Lever. Center: Construction of Guide. Lower Right: Assembly of Hanger

Attach a pulley and a screweye to the overhead beam, and a pulley to the end of the adjusting lever. Then fasten a length of small wire rope to the screweye and reeve it through the pulleys as shown. Lead the end of this rope down to a pivoted lever that is fastened to a convenient post, or to the wall, and attach it so that, when the lever is up, the motor wheel will be lowered to the bottom of the guide; when the lever is down and always in line with the machine below.

Place the control lever in a convenient position and remove the tire from the rim, to leave a pulley large enough for high-speed work. Belt the machine so that the belt is loose when the lever is raised; this allows the motor to run without operating the machine. As soon as the power lever is pulled down and caught under the catch, the belt will be tightened

and the machine will turn. In this way the engine can be kept running while the machine is stopped for any reason.

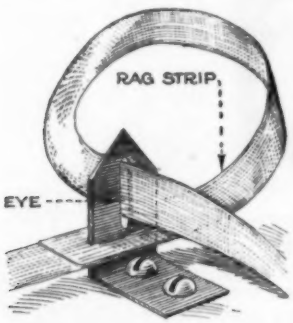
The engine is started by setting the controls and spinning the rim, and the speed can be regulated to suit the work in hand by means of the spark and throttle controls.

Starting a Saw Cut Smoothly

Everyone using a handsaw has, at one time or another, had trouble in getting the cut started in the wood, as the teeth catch in the edge and either stop the saw or mar the edge. A remedy for this is to file smaller teeth on the last two inches of the blade nearest the handle. This may be done by filing the point off the teeth so that a notch can be cut in each of the old teeth, thus making two teeth from each one. A few strokes with these small teeth will start the cut easily. If more convenient, the small teeth can be filed at the outer end of the saw.—Chas. N. Shaw, Jr., Oxford, Ga.

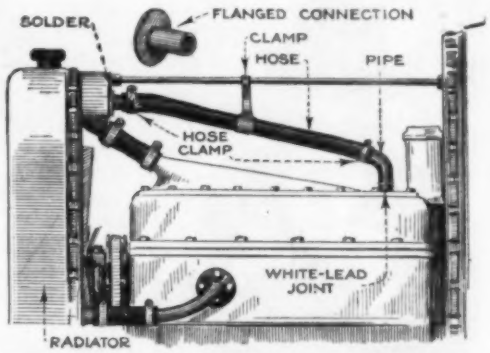
Joining Rag Strips for Weaving

Much of the time and labor required to sew the strips of rags together, which are to be woven into carpet or braided into rugs, can be saved by a simple and easily made device. A small piece of thin, flat steel is bent at right angles, the upper end pointed and sharpened, and a slot or eye cut in it, through which the strips may be inserted. Two holes are also drilled into the horizontal part for attaching to a table or wooden block. In use, the strip to be joined is laid over the end of the other and both pushed down over the sharpened point; then the loose end of the former piece is brought through the eye, and pulled up close. When this has been done, the junction of the two strips is pulled up from below, the portion in the eye passing through the slit. After the strip has been pulled out of the eye and drawn up tightly, the resulting joint will be almost perfectly flat.



Auxiliary Piping Prevents Overheating

A means of preventing an automobile engine from overheating can be provided by adding an auxiliary outlet pipe in the manner suggested in the drawing. A hole is drilled and tapped near the rear of the cylinder-head casting to take a 1 or 1¼-in. pipe; this is bent as shown, and, after coating the threads with white lead, screwed into the hole. A hole is cut into the back of the upper header on the radiator, and a flanged connection of the type shown is soldered, or, better, brazed to it. The two connections are united by a section of rubber hose, which, if inclined to vibrate too much, can be supported from the radiator stay rod. The extra pipe allows the hot water from the rear cylinders of the engine to pass to the radiator without passing over the forward cylinders.



Preventing Overheating of Automobile Engine by Providing an Auxiliary Pipe: Thus the Water from the Rear Cylinders Passes Directly into the Radiator

Repair for Broken Eyeglass Spring

Wearers of pince-nez or "nose glasses" often find that one or both of the small springs on the bridge of the nosepiece are broken, or have become so weak that the glasses slip off. Of course, the proper thing to do is to take the glasses to a jeweler or optician for repair, but, in an emergency, resort can be had to the method illustrated. One end of a small rubber band is slipped over one of the guards and wound around the bridge often enough to obtain the proper tension, when the opposite end is pulled over the guard on the opposite side.—Truman R. Hart, Ashtabula, Ohio.

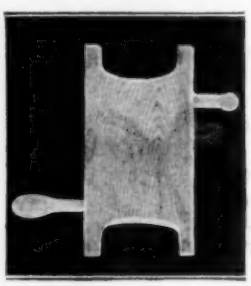
Match-Box Holder and Lighter

Easily made from a piece of sheet metal, the match-box holder and cigar lighter illustrated makes it possible to carry the small boxes of safety matches in the pocket without crushing, and provides a windshield for the flame so that it is easy to get a "light" even in a strong wind. The sheet-metal strip from which the device is formed is cut to the width of the match box, which is about 2¼ in. long. A slot is cut in the middle of the pattern, through which the match to be struck is inserted. Also, an ear, about ⅞ in. long, is provided on what is to be the bottom. After the sheet-metal form has been cut, it is bent as shown, and the ear is turned up and soldered to the sides. The holder illustrated is embellished with a foreign coin.

A Match-Box Holder and Cigar Lighter That Prevents the Small Boxes of Safety Matches from becoming Crushed in the Pocket, and Provides a Windshield That Makes It Possible to Get a "Light" Even in a High Wind

A Two-Handled Cord Reel

A reel that will save much time in the winding of kite strings, fishlines, clotheslines, and other cords, can easily be made from a piece of board of the proper length. The ends are cut out to hold the cord and to prevent it from slipping off, and handles are fastened on opposite edges of the board, near each end, as illustrated. After attaching the cord to the reel it may be wound up easily and rapidly.



Pulling Light Car Out of Mud

An owner of a light automobile has used a novel idea for extricating his car from bad mudholes. He raises the engine hood and passes one end of an ordinary clothesline through the footboard, tying it to the clutch pedal. The engine is then speeded up, the driver walks to the loose end of the rope, throws it over his shoulder, and pulls. This throws in the clutch and applies power to the rear wheels, which, together with the force of the pull and the lessened weight in the car, suffices to pull the car out in most cases. As soon as the pull on the rope is relaxed, the clutch will throw itself out, and the car stops. The emergency-brake lever should be kept in the neutral position during the operation; this allows the low-speed band to engage, but prevents the pedal from flying back into high and stalling the engine.

Keeping Insects from Light Bowls

A mercantile concern has a large number of inverted electric-light globes under a balcony that runs around the store. Formerly it was a regular weekly job for the porter to unscrew the globes and remove the accumulation of dead insects and other matter that collected in the bowls. Finally, shields of glass, cut circular to fit the open ends of the bowls, and with a hole in the center to slip over the light sockets, were used to cover the openings. This arrangement did not interfere with the illumination and kept out the dust and insects. Having successfully demonstrated its usefulness, the idea was applied to all the lamps in the store.—Chas. A. Goddard, Los Angeles, Calif.

¶A small hole drilled through the socket provided in stove lids for the lifter, will allow the light from the fire to shine through so that the location of the socket is easily found in the dark.

Making Varicolored Flash Papers for Stage Effects

Amateur plays are often produced in small communities where there is no electric-lighting current. If the play calls for fire scenes, lightning, artillery fire, explosions, etc., it is difficult to produce much of an effect without electric lights. For just such occasions, a set of varicolored flash papers will produce the effects desired. These papers can be prepared at home at small cost.

It is well, at this point, to call attention to the danger attending the use of these sheets, as well as of colored fires, etc., in close proximity to scenery, costumes, and other "props" that have not been fireproofed. Sheets of tissue paper, about 12 in. square, are used; these are cut in half for small, weak flashes, while, for longer ones, a whole sheet can be used. The tissue paper is soaked in aqua fortis, which should be bought ready-mixed from the druggist. The paper is thoroughly soaked, but is taken out of the solution as soon as possible, rinsed in running water, and hung up to dry. A wooden clothespin, or something of the sort, should be used to remove the paper from the acid, which should be prevented from contact with the fingers or clothing. When the papers thus treated have dried, they are pinned to a stick, held at arm's length and touched off with a match at one corner. They will burn with a brilliant white flash.

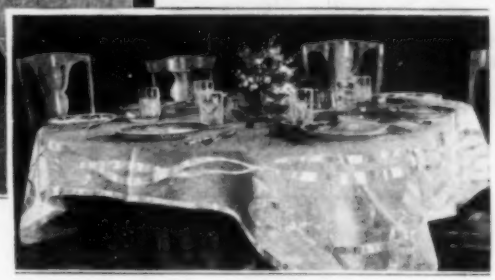
Colored flashes are made as follows: In all cases the paper is first treated as described above, and dried before immersion in the chemical solutions that produce the colors.

For red, dip the treated sheets in a solution of water and nitrate of strontium. Blue is obtained by soaking in copper-nitrate solution. Green can be produced from a solution of copper chloride, while a solution of calcium nitrate will produce another red. A beautiful violet flash is made from a solution of saltpeter and water.

Be sure to pin the paper to the end of a stick, which can be held at arm's length, or else fasten to a tin reflector before lighting.

Dining Table Made from a Small Gate-Leg Table

Usually the extension dining table is a cumbersome affair for the small family dwelling in a modern apartment. The illustration shows a table that affords a real economy of space. A small gate-leg table was used, and provided with additional capacity for guests by using the two-piece auxiliary top shown. The thin boards used for making



Above: The Gate-Leg Table and the Two Parts of the Sectional Top. Below: The Sectional Top Hooked to the Small Table

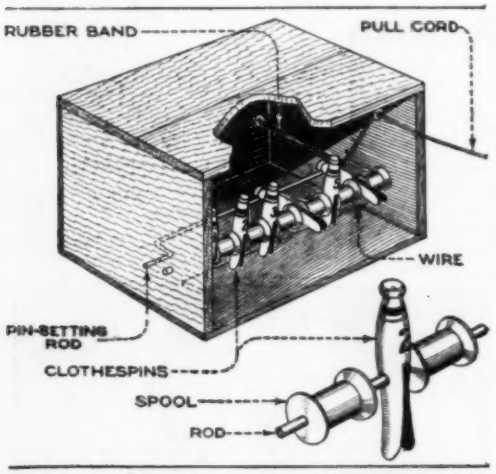
the halves were screwed to wooden battens; hooks were provided for holding the sections together at the center and to the supporting table. The small table will serve for two or three persons, while eight can be seated when the sectional top is used.—Walter C. Harris, Brooklyn, New York.

How to Bleach Beeswax

Pure white wax, which is not only desirable for certain uses but brings a higher price on the market, is obtained from ordinary yellow beeswax. The yellow wax is sliced into thin chips and laid on cloth-covered frames or trays, supported a few inches above the ground, in the open. The flaked wax is turned over frequently, and occasionally sprinkled with clean soft water, if there is insufficient dew or rain to moisten it. The wax should be bleached in about four weeks, but if, on breaking the flakes, the wax still appears yellow on the inside, it is necessary to remelt it and expose a second time or even a third, until it is thoroughly bleached. The time required for proper bleaching depends largely upon the condition of the weather and the amount of sunshine that falls on the wax.

Shooting Gallery for Toy Pistols

Skill in shooting toy pistols, blowguns, and similar harmless weapons that use peas, marbles, or wooden darts for ammunition, can be easily acquired by practicing on a target of the type shown in the drawing. Clothespins, spools, and some wire are about the only materials required. The clothespins, a spool between each pair, are placed on a stiff wire or small rod and fitted in a box, as shown. Back of the clothespins and a little above their lower ends is a second wire that holds them upright; this wire should be placed so that the pins will lean forward a little. When these targets are knocked over by an expert—or lucky—shot, they are caught by the pin-setting rod at the back; this rod is bent from a piece of stiff wire, and is held horizontally by a rubber band. When all the targets have been knocked over, or after each marksman's turn is over, the pins are reset by a pull on the cord tied to the pin-setting rod. If desired, the clothespins can be painted and designated by numbers.—Louis M. Steffen, Dayton, O.



A Pistol Butt for Indoor Use, by Means of Which the Young Marksman can Improve His "Shot," with Harmless Weapons Such as Marbles, Peas, and Darts

How to Bake a Fish in Clay

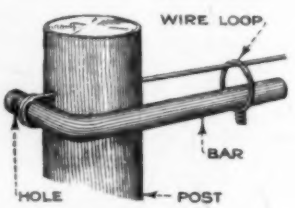
A clay-baked fish is so simply prepared, compared with cooking it in camp, that it will be hailed with delight. The best kind of clay to use for the purpose is the gray clay generally found along streams, but in the absence of this, ordinary red clay will answer. The fish is cleaned and washed, stuffed if desired, and sewed up in the ordinary way; the head of the fish may be left on. The clay is packed around the fish so that there will be a 2-in. thickness of it at all points, and it is then ready to be tucked into the fire. Previously, a hot hardwood fire has been kept going; ash is to be preferred because it produces hot coals that last a long time. It is generally a good idea to convert the evening campfire into a heap of coals for the purpose. The fish is placed at the bottom of the coals, covered, and left overnight. In the morning the coals are scraped away, and the hard-baked clay crust broken away with the camp hatchet, exposing the thoroughly cooked fish, savory and palatable to the last morsel. A 5 or 6-lb. fish makes an ideal bake.—Robert Page Lincoln, Minneapolis, Minn.

Swing Stand Used during the Winter

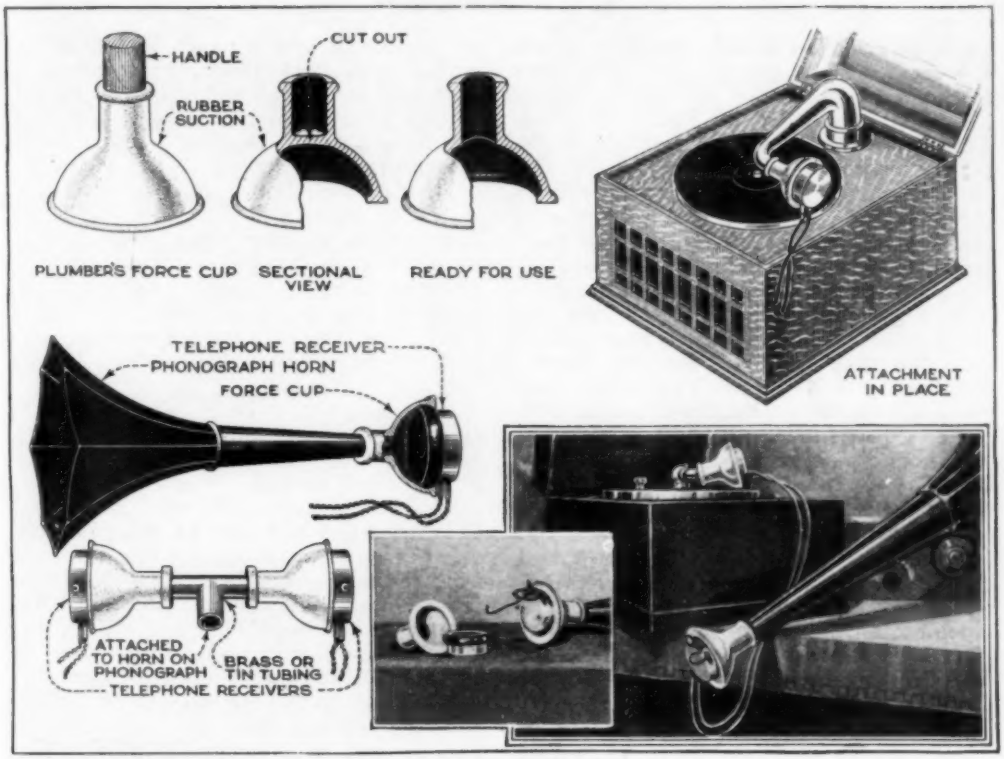
A familiar type of porch swing is suspended from a frame of steel tubing so that it can be moved to any location, either on the porch or lawn. During the winter months, when the swing is not in use, the steel frame can be used to provide additional space for the storage of clothing. This is accomplished by removing the swing from its stand and hanging the clothes—which are placed on hangers, of course—from the horizontal crosspiece.—Mrs. Elizabeth Bachman, Fullerton, Pa.

A Simple Wire Stretcher

A novel arrangement, that is simply installed on any wire line to facilitate lowering or raising, or to maintain a uniform tension, is shown in the drawing. It is made from a bent bar of round iron.



Such a device is being used, in one instance, to keep wire clotheslines taut, so that no props or other supports are necessary. The wire is led through a hole in the post and fastened through a hole drilled in the bent bar. Turning of the bar crank winds the wire around it and tightens the line. The crank is held in place and prevented from unwinding by a loose loop, or link, which is slipped over its end.



Simple Methods of Making a Loud Talker for the Radiophone-Receiving Set: One or Two Force Cups, with a Few Scraps of Tubing and a Discarded Phonograph Horn, Are the Only Materials Necessary

Making Loud Talkers for Radio-Receiving Sets

A variety of devices for amplifying the sounds received through the radiophones are on the market for the choice of the owner of a radio-receiving set—if he cares to pay the price. If his means are limited, the ideas illustrated may be applied at a cost of well under a dollar.

The only material required is one or more small force cups, such as can be bought from any plumber or hardware store. Usually these cups are mounted on a wooden handle, and this is removed, as the rubber cup is the only part used. Between the handle socket and the hemispherical cup there is a dividing wall of rubber that must be cut out, which makes the cup ready for use. One of the phone receivers is fitted inside the large end of the cup and the neck is slipped over the tone arm of a phonograph, after the soundbox or reproducer has been removed, or over the end of a horn as in the drawing. A larger volume is, of course, obtainable by using both receivers of a headset and mounting them on the ends of a tee.

Efficiency of Spark-Plug Points Improved by Sharpening

As the result of investigation as to the advantage obtained by varying the form of the electrodes through which a high-tension current was passed, it was found that the same voltage would bridge a gap from 25 to 50 per cent greater when the points were made very sharp, than when they were blunt. This knowledge was put into practice on a number of cars in which trouble was experienced due to persistent fouling of the plugs with oil and carbon. As a result of these tests, extending over a year, the invariable practice in one shop, when fitting new plugs, is to file the electrodes to a point, and make the gap the usual thickness, that of a worn dime. The practice has overcome the trouble with the plugs, and has made cylinders, which previously required weekly cleaning of the plugs, operate without a "miss" for months. It is necessary to set the points closer after a long period of operation, as the smaller points burn away quicker than the usual circular-section electrodes. It is most important to sharpen the positive electrode.

How to Make Artificial Pearls

By R. R. HENDERSON

ARTIFICIAL-PEARL making would seem, at first glance, to be a process somewhat beyond the skill of the amateur, but, as a matter of fact, very good-looking "pearls" can be turned out in the home workshop. The art is not difficult, and can readily be acquired by practice.

For many years, artificial pearls were made by coating the outside of small glass beads with a luster paint. This method, however, had the disadvantage that constant wear caused the paint to chip off, leaving the glass bare. At the present time this method is used for the cheaper grade of goods only. The better and more expensive artificial pearls are now made by first blowing thin glass globules, with a hole in each end, from thin-walled glass tubing. Then, by a special process, the interior of the globule is coated with a luster solution.

First obtain a supply of thin-walled glass tubing of small diameter. The exact size of tubing and thickness of wall depend upon the size of pearls one wishes to make, but for most ordinary uses, tubing of ⅛-in. outside diameter and walls 1/32 in. thick will serve.

Place one end of a piece of tubing in the flame of a Bunsen burner, as in Fig. 1, and rotate it slowly until the glass melts and runs together, closing the hole in the end of the tube. Remove the tube from the flame and let it cool slightly. Then again insert the tube in the flame, about 1 in. from the closed end, and rotate it slowly so as to heat it uniformly all around. When the glass becomes red-hot and soft, remove it quickly from the flame and blow in the open end, as in Fig. 2, until a bulb or globule of glass appears of the desired size. Be careful not to heat the glass until too soft or to blow too hard, or the bulb may accidentally be blown so thin as to burst it. Also, if the tubing is not uniformly heated all around, the hottest spot will swell out first, and a globule of imperfect roundness will be formed. A complete globule, blown near the end of the tube, is shown in Fig. 4. After blowing the first globule, let it cool a moment so as to set and become hard. Then heat a place on the tube beside the first globule, Fig. 4, and blow another; continue in this manner until as much as possible of the length of the tube has been used, as in Fig. 5. Now, with a small three-cornered file, make a scratch between each globule and break them apart. The small tips left on each end may be ground off by rubbing on a piece of emery paper, and then polishing with wet chalk, or, preferably, they may be melted and closed in slightly to give a finer hole, by holding the globule in a pair of tweezers and rotating the end in a fine flame. Wash a quantity of the globules in a pint of water, to which a spoonful of washing soda has been added, stirring them around thoroughly; rinse them in three or four changes of clear water to remove every trace of the washing soda, then place them in a pan in an oven to dry. The globules should not be touched by the hands after washing.

Now prepare a very thin varnish by dissolving a small quantity of mastic in acetone. To this add a very little ordinary copal varnish. Then stir into this thin mixture a quantity of "fish silver." This material consists of the carefully dried, ground, and sifted white scales of fish; it may be obtained from dealers in artists' and decorators' supplies. The complete solution, already mixed up, may also be obtained, under the name of "pearl solution" or "essence d'Orient."

Construct a coating apparatus from a glass or enamel-ware jar, as shown in Fig. 6; this is so arranged that it may be rapidly rotated about an inclined axis, and should be equipped with some sort of cover. An ordinary preserve jar serves well. Place in the jar a small quantity of the fish-silver and varnish mixture, and about three times as great a bulk of the glass globules, close the cover, and rotate the jar rapidly. In a few minutes it will be found that the interior of every globule is coated with the luster mixture, and that all the excess liquid will be in the form of drops in the inside of the globules, capillary attraction, assisted by the rubbing of the globules together, which prevents the coating settling and adhering to the outside, having drawn the liquid to the inside. Now heat the jar gently with a gas flame or alcohol lamp, rotating it again rapidly, leaving the cover off. In a short time the excess liquid will have evaporated, leaving on the interior of the globules a hard coating of the luster material, and giving the effect of natural pearls. Care must be taken that the luster varnish is very thin, and that only a small quantity is used, to prevent the excess from sticking to the inside of the jar, or to the outside of the glass globules. If, by any chance, a little of the coating should stick to the outside of the globules, it may be removed by putting them

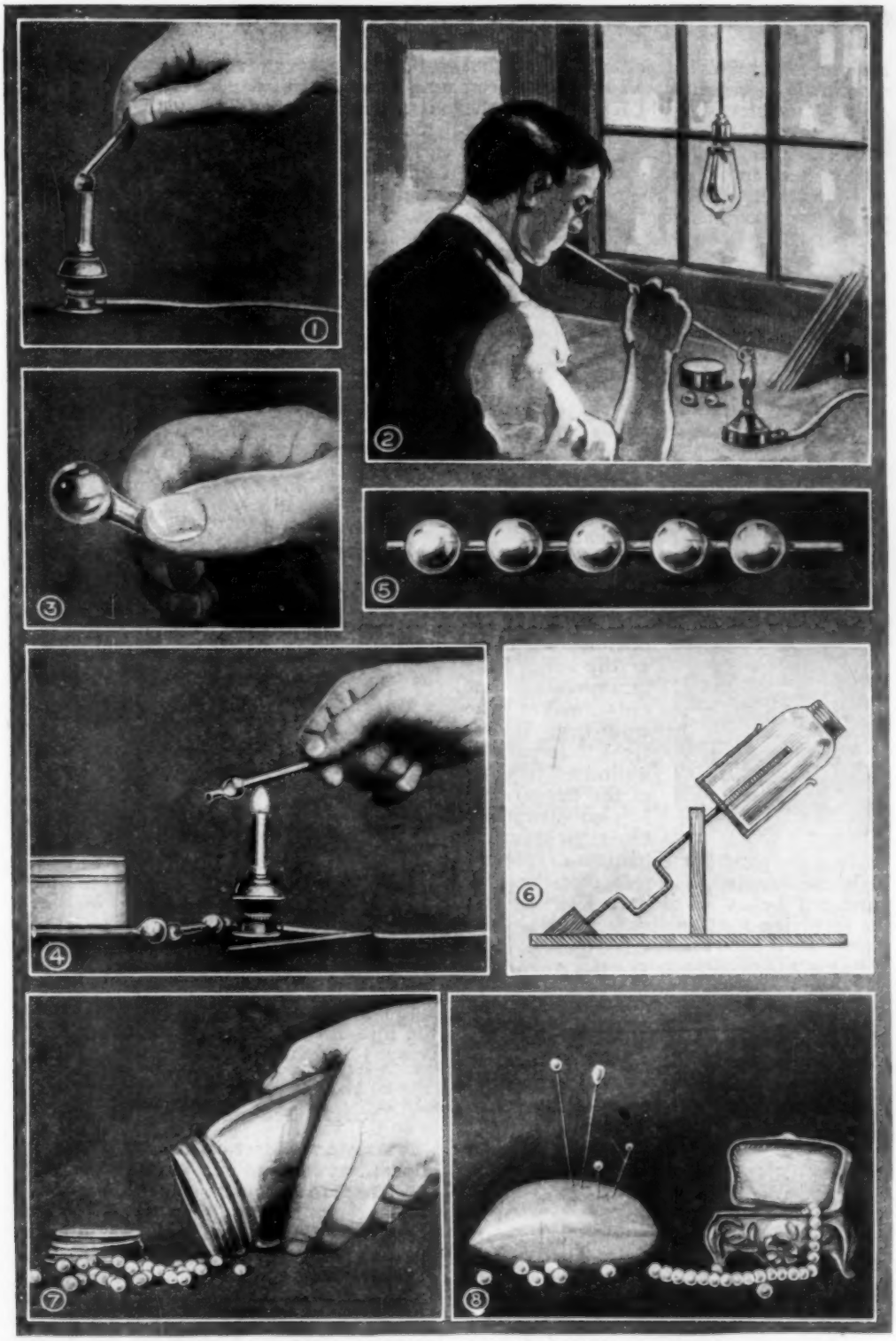


Fig. 1, Closing the End of the Tube; Fig. 2, Blowing the Globule; Fig. 3, a Hatpin Globule; Fig. 4, Preparing the Tube for the Second Bulb; Fig. 5, a Complete String of Bulbs; Fig. 6, the Coating Apparatus; Fig. 7, Emptying the Jar after Coating, and Fig. 8, Complete Hatpins, Stickpins, a Necklace, and Some Loose Pearls. This Is an Interesting Hobby, and Is Well within the Skill of the Amateur

back in the revolving jar, with an equal amount of sawdust which has been slightly moistened with acetone. If the jar is then rotated, the rubbing of the pearls against each other and the sawdust will clean them. They may be polished by rotating in the jar with fresh, clean, dry sawdust. It is best first to sift the sawdust, so that it will contain no grains small enough to get inside the pearls through the small holes. Use the sawdust that remains on the sieve.

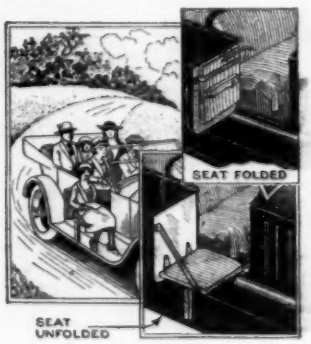
To prepare glass globules for hatpins, seal one end of a glass tube by rotating it in the flame and blow the globule directly from this sealed end; Fig. 3 shows a hatpin globule. When cut from the tube by a three-cornered file, this gives a globule with only one hole. It is coated in the same manner as the ordinary beads. Pins may be fixed in place by imbedding them in a small amount of light-colored melted sealing wax run into the bead around the pin.

Cork Prevents Double Exposures

After accidentally bumping the trigger of his box camera a few times and getting double exposures, the owner decided that some step must be taken to prevent this. The method consisted simply in the insertion of an ordinary cork into the opening in front of the lens. This arrangement not only makes the opening light-tight, but permits unlimited tripping of the trigger, and is also dustproof, thus protecting the lens and shutter mechanism. It should be borne in mind, however, that the cork must not be so long as to bear against the revolving shutter disk.

An Auxiliary Seat for the Auto

Upon occasion it is desirable, especially with a two-passenger car, to accommodate an extra passenger. One method providing this extra seat is that shown in the appended sketch. This consists of a hinged seat attached to one of the right-hand doors as shown, and provided with a hook and leg on the forward edge of the seat, for its support.

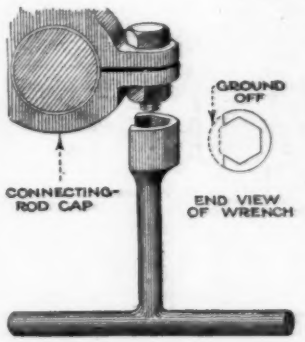


This seat has the advantage that it can be folded snugly against the door when not in use.

For roadside tire repairs, or other troubles, this seat provides a handy place to work without stooping, and a shelf for the tools.

Socket Wrench for Connecting Rods

The socket wrench shown in the drawing was made for the purpose of tightening the bolts used to hold the caps of automobile connecting-rod bearings. The space between the cap body and the inner edge of the nut is generally so small that only a very thin socket wrench can be used. The result is that the wrenches are often broken. For the tool illustrated, a heavy wrench is used, one side being ground off. With this wrench the nut can be drawn up tightly without resort to a hammer and chisel.



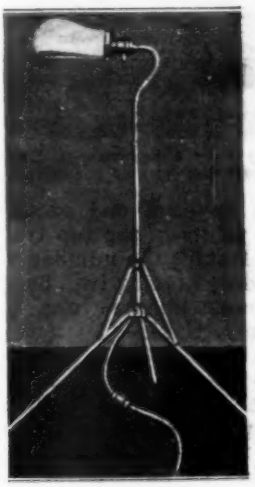
Thought Transference with Dice

A simple arithmetical trick, that is very impressive, consists in asking a member of the party to throw a pair of dice on a table, then telling him what he has "thrown." In order that the person performing the trick may not see the dice, he goes to another part of the room, where he remains until the conclusion of the trick. The performer then requests the person casting the dice to use the uppermost figure on one of the dice and multiply this by 2, then add 5 to the product,

multiply the sum by 5, and, finally, add the uppermost figure on the second dice. When he has done this, the performer tells the number of spots showing on each of the dice, although he has not seen them.

When the performer is told the number that has been obtained by the above process, it is only necessary for him to subtract 25 from it, and the remainder will be a two-figure number; one of these figures will be the number of spots showing on one of the dice, and the second will be that on the other. Thus, for example, assuming that the person tells the performer that his final number is 67, by subtracting 25 from it, 42 is obtained; then the performer knows that the figure on one of the dice is 4 and that on the other is 2. The operation from beginning to end is: $4 \times 2 = 8 + 5 = 13 \times 5 = 65 + 2 = 67 - 25 = 42$.—Raymond Dixie, New Haven, Conn.

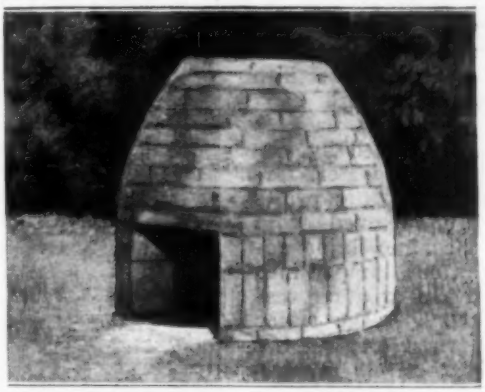
Reading Lamp Made from Music Rack



An old music stand can be made into a very serviceable and satisfactory adjustable reading lamp simply by attaching a lamp to it. The flattened end of the sliding tube is sawed off, and the tube filled with melted resin and bent as shown, after which the work is heated in order to melt the resin and allow it to run out of the tube. This makes a reading lamp that can be adjusted for height and is readily portable.—L. Ringer, Cincinnati, Ohio.

A Camp-Site Incinerator

Proper sanitation is a first necessity in an auto-tourist's camp site. A small garbage incinerator can be built at little expense, and the aid it will render in keeping the place sanitary is well worth the small outlay of labor and materials. The inner lining should be of fire brick, while ordinary bricks, old or new, will serve for facing. Built like an old-fashioned beehive, the incinerator has a fire grate about 18 in. from the bottom,



Incinerator for a Camp Site Used Mainly by Auto Tourists Helps to Keep the Camp Sanitary and Free of Refuse of All Kinds

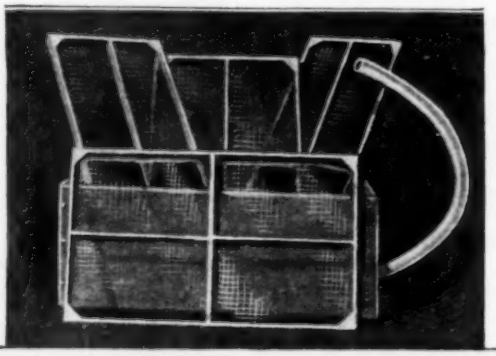
with an opening at the top equal to about one-half its diameter at the bottom. After a wood fire has been started under the grate, the refuse is dumped through the top hole, and will be gradually consumed without further attention on the part of the caretaker. Further to facilitate the disposal of refuse, each tourist, as he enters the camp, should be provided with a wire basket in which he is requested to deposit the refuse from his tent.—C. L. Meller, Fargo, N. D.

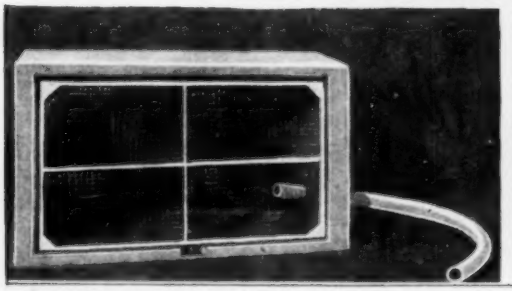
Sewing Kit Made from a Cigar Box

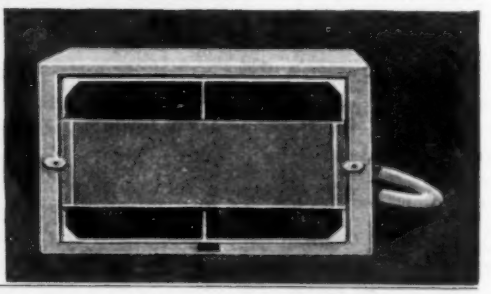
An ordinary cigar box, preferably one used for holding 50 cigars, provides a good container for spools of thread, and other sewing materials, when fitted up as shown in the illustration. Two long aluminum knitting needles, such as can be obtained for a few cents, are fitted into holes drilled in the ends of the box. In the end at which the knitting needles are inserted, the holes are a loose, sliding fit, while at the opposite end they are a little smaller so that the needles will be held in place by friction. The spools turn freely on the rods, which need never be removed except when an empty spool is taken out to make room for a new one. The remaining space in the box can be used for pincushions, scissors, and other articles.

A Novel Photo-Print Washer

A great deal of time is saved by the user of the print washer illustrated, and the prints are thoroughly washed, as they do not come into contact with each other, and each is surrounded by circulating water. Ordinarily, the prints are removed from the hypo fixing solution, dumped into a pan or other vessel, and the water turned on; as the wet prints always stick together more or less, there is no assurance that all of the prints are thoroughly washed.







Above: The Wooden Container and Four Copper-Wire Trays, Each Divided into Four Compartments. Left: Top View of the Washer. Right: Strip of Sheet Metal Fastened at Each End over the Top of the Washer

This print washer consists of a wooden box, which serves as a container for four trays, divided into four compartments, one for each print. The trays are made of copper-screen wire, to prevent rusting, and the sides, ends, and partitions are made of narrow strips of galvanized iron, soldered together and to the wire screen. A small strip of wood is placed in the bottom of the box to keep the trays from the bottom, and allow a free circulation of water underneath. The hose that carries the water from the faucet to the washer enters the box at the bottom. In use, a strip of sheet metal is placed over the top and fastened with buttons on each end of the box, to prevent the prints in the top tray from washing out. Double the number of prints can be washed by placing two, back to back, in each compartment.—John T. Daniel, San Francisco, Calif.

The Care of Leather-Bound Books

Bookbinding leathers have a tendency to dry out and finally break at the hinge, if the leather is not kept flexible by occasional greasing. For this purpose any high-grade vaseline, free from acids, may be used. The following method of greasing the leather is that used in a large library to preserve the sheep bindings of legal volumes:

The work should be done in a well-lighted, airy place, preferably in the summer, when the windows can be opened to let in the outside air. Place the book, back up, on a table having a smooth top, and coat the back with vaseline, rubbing it well into the grain of the leather with the hand. Next, treat the sides and edges, being careful not to get any of the vaseline on the paper. Use small quantities of vaseline and rub it in well, with a firm, flexible stroke. The first application is usually absorbed rapidly. Next apply a second coat and rub the leather down well as before. The back and back edges require more vaseline than the sides and front edges. Then place the book on a shelf to dry, which takes from 24 to 48 hours, and finally rub off all surplus grease.

Merely dabbing on the vaseline with a cloth and rubbing it off does not suffice. Neither is one application, left to dry in by itself, satisfactory. Light rubbing with cloth pads will not do the work as well as rubbing with the bare hands. Also it is better to use small quantities of vaseline, and make several applications, according to the condition of the book.

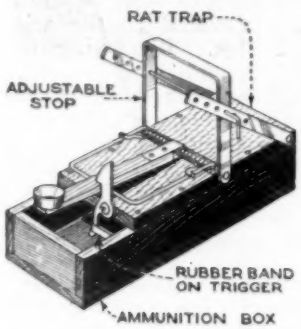
Fusible Alloys for Setting Crystals

Radio-sensitive crystals, such as galena, silicon, and the like, should be imbedded in metal to obtain the best results, and this is done by using an alloy that melts at a point considerably below the boiling temperature of water. Heat destroys the sensitiveness of the best crystals, and for that reason lead cannot be used.

An alloy which melts at 197° F. is composed of lead, 3 parts; tin, 2 parts, and bismuth, 5 parts. The melting point of the metal can be still further reduced by adding 1 part of warm mercury to the molten alloy when it is removed from the fire. The addition of mercury will cause the alloy to remain liquid at 170° and become a firm solid only at 140°. The boiling point of water is generally taken as 212° F., although the higher the elevation above sea level the lower this temperature will be.

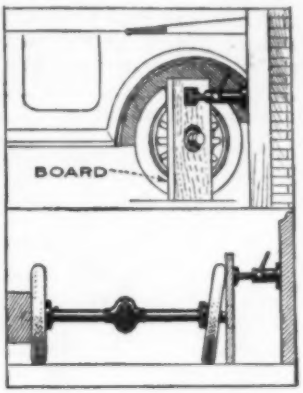
Making a Toy Catapult

A 10-cent rat trap of the type shown in the drawing can easily be made into a marble-throwing catapult, the range of the missile being regulated by an adjustable stop. The trap is fastened to the edges of the ammunition box and the bait hook is removed. The stop is then bent from a strip of sheet metal and fastened to opposite edges of the trap as indicated. Two side arms that serve as braces for the stop are adjusted by means of a wire pin passing through holes in the stop and arms. The throwing arm should be made of ½ by ½-in. hardwood, about 10 in. long, although the length is best determined by trial. A small metal cup at the end of the arm provides a pocket for the ammunition. If desired, a trigger arrangement, similar to that shown, can be added to the device. Flour, tied in tissue paper, may be used to make a realistic bomb, as it gives off a smokelike puff when it strikes, and is harmless. The longest throw the device is capable of, will usually be attained when the stop is set at an angle of about 45 degrees.—J. H. Kindelberger, Cleveland, Ohio.



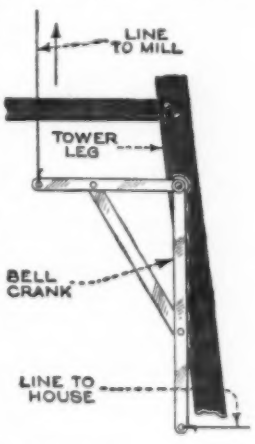
Straightening a Bent Auto Axle

When an automobile skidded into a partly obscured curb, one of the rear-axle shafts was badly bent. The wobble of the wheel was so pronounced that further driving was out of the question. This happened near the garage, and as the use of the car was necessary for delivery purposes, the method illustrated was used to straighten up the wheel. A piece of plank, about 3 ft. long, had a hole cut in its center to clear the wheel hub. Driving the car into the doorway of the brick garage, a jack was placed between the upper end of the plank and the side of the doorway. The opposite wheel was blocked to prevent the car from being pushed sidewise, and pressure exerted on the jack straightened the axle. Repairs made in this manner should not be considered permanent.



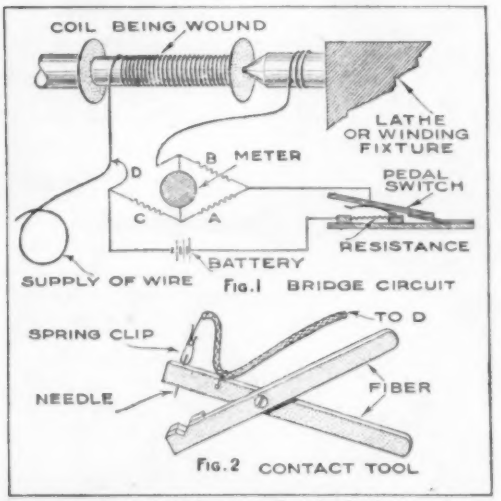
Windmill Controlled from the House

Having to go from the house to the windmill, some 30 rods away, in order to stop it when the tank is full, soon becomes quite a nuisance. To avoid this, and to control the operation of the pump from the house, the arrangement shown by the drawing was worked out. A bell crank made from a piece of tire iron, was pivoted to one of the tower legs with a bolt. Wires fastened to the ends of the crank were led to the house and to the controlling mechanism of the windmill for throwing the pump out of gear. The pump can also be started by releasing the control wire.—Rufus E. Deering, Ottawa, Kan.



Wheatstone Bridge for Coil Winding

To wind electrical coils that must possess a certain resistance, or to wind a coil that will have the same resistance as another, are real problems to the experimenter unless he knows how to go about it. Almost every amateur is familiar with



Winding a Coil of Wire to a Certain Resistance Is an Easy Task When the Wheatstone Bridge Illustrated is Used

the Wheatstone bridge, by name at least; this is usually represented by four resistances in a diamond-shaped figure, with a battery connected at two of the points of the diamond and a galvanometer across the other two. When there is no current passing through the meter, it shows that the four resistances are balanced, and in proportion; that is, A is to B as C is to D. The voltage of the battery and the markings on the instrument need not be known or correct, as the accuracy of the result does not depend on them. Fig. 1 shows a method of applying the bridge principle to a coil as it is being wound, so that one may know just where to cut off the wire to get the right resistance. The galvanometer should, of course, be as sensitive as possible; it is not difficult to make one from a compass and a coil or two, or an excellent galvanometer can be obtained by removing the resistance coil from any good moving-coil voltmeter, or by connecting direct to the meter so as to bypass the resistance. The resistances A, B, and C must be of known value, if the coil is to be made a definite number of ohms, but if any one of them is of known resistance, two more can be made equal to it, by using ordinary bridge methods, so that only one known resistance is necessary at the start.

In the figure, the coil being wound forms side D of the bridge; the inner end, or that next the meter, is grounded on the dead center of the lathe or winding fixture, and a temporary contact is made with the last turn wound by piercing the insulation. The pedal switch shown serves two purposes: It connects the battery in the circuit after the contact is made at D, and, as the pedal is further depressed, shorts out a resistance. This resistance is in series with the battery, and should be high enough to protect the meter from the high current which will result if the four sides of the bridge are much out of balance. When the first contact of the pedal switch closes and it is seen that only a small deflection appears on the meter, then the pedal can be pressed farther down, shortening out the resistance and giving greater accuracy in balancing the coil resistance against resistances A, B, and C. Fig. 2 shows a simple and handy tool for making the contact at D. Two pieces of fiber or hardwood are pivoted together at the middle; one is notched, and through the other a sharp steel needle is driven which is connected to the wire leading to the bridge. By laying the magnet wire in the notch and gently closing the needle point against it, the point will pierce the insulation sufficiently to make contact, but without damage of any importance to the cotton or enamel insulation.

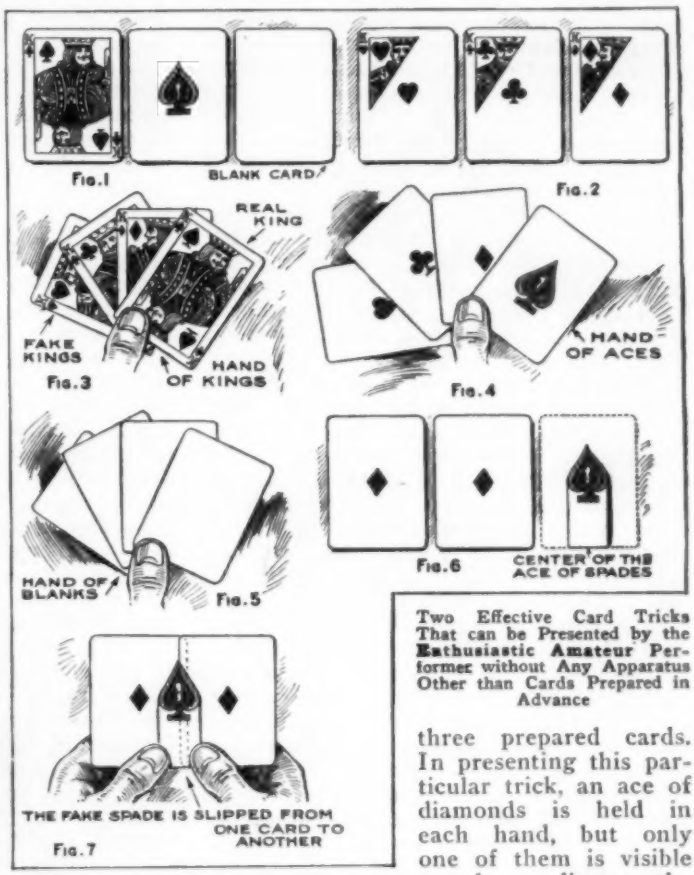
Spreader for Split Rims

Automobile owners and drivers generally have trouble in bringing the ends of a split rim together when a new tire has been placed on it. Various tools are made for this work, but unfortunately, they are not usually carried on the car. The drawing shows a simple method of using the jack, which no motorist is without, and a short block of wood. Pressure exerted on the rim through the jack and block will force the ends together speedily and easily. A block may be placed under the jack, to protect the rim.—Harry G. Schultz, Teaneck, N. J.

Two Effective Card Tricks

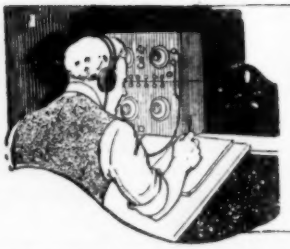
The first trick involves the use of four cards, which are "fanned" out, to show a corresponding number of kings, the performer repeats the magical "abracadabra," and, presto! the same hand has changed to four aces when it is again displayed—a third pass, and only blank cards are shown. Six cards are required for this trick, three of which are unprepared, the other three being "prepared." The three unprepared cards are the king, ace, and blank card shown in Fig. 1, the three other cards being prepared by pasting a part of the remaining three kings over a corner of the aces of their corresponding suits as shown in Fig. 2. In the presentation of this trick, the four kings are first displayed to the audience. The real king being on top, the cards are fanned as in Fig. 3, so as to show only the kings on the corners of the other three cards. Then, the performer picks up the ace of spades, which has been left face up on the table, and announces that he will place it directly behind the king of spades, which he does. He then lays the king of spades on the table. The cards are then closed up and turned over so that the cards are held at what is the top of the cards in the first presentation of the four kings. Then, the cards are fanned out to show the four aces, as in Fig. 4. The index numbers in the corners of the aces should be erased or covered up, otherwise it will be impossible to show the blank cards.

The manipulator now states that by placing a blank card, which he picks up from the table, where the ace of spades is, the spots will disappear from all the cards. The ace of spades is placed on the table, the blank card taking its place. The cards are then closed and fanned out, the hand showing four blank cards, as in Fig. 5. In the second trick, an ace of diamonds is held in one hand and an ace of spades in the other, but while held in full view of the audience, the cards change places. The prepared cards are made from two aces of diamonds, from which the corner index pips and letters have been erased. An ace of spades is also required, the center of which is cut from the rest of the card as indicated in Fig. 6, which shows the appearance of the



Two Effective Card Tricks That can be Presented by the Enthusiastic Amateur Performer without Any Apparatus Other than Cards Prepared in Advance

three prepared cards. In presenting this particular trick, an ace of diamonds is held in each hand, but only one of them is visible to the audience, the other being concealed underneath the ace that has been cut from the card. The performer then announces his intention of making the cards change places. He turns the backs of the cards toward the audience, and, with the hands apart, begins moving the cards back and forth, bringing them a little closer to each other at each pass. Finally, when the edges touch, as in Fig. 7, the false center from the card is slipped over and onto the other card; this done, the cards are moved back and forth, gradually separating them, and their faces are again turned to the audience, when, to all appearance, the cards have changed their positions.



BUILDING A SIMPLE RADIO RECEIVER

By F. L. BRITTIN

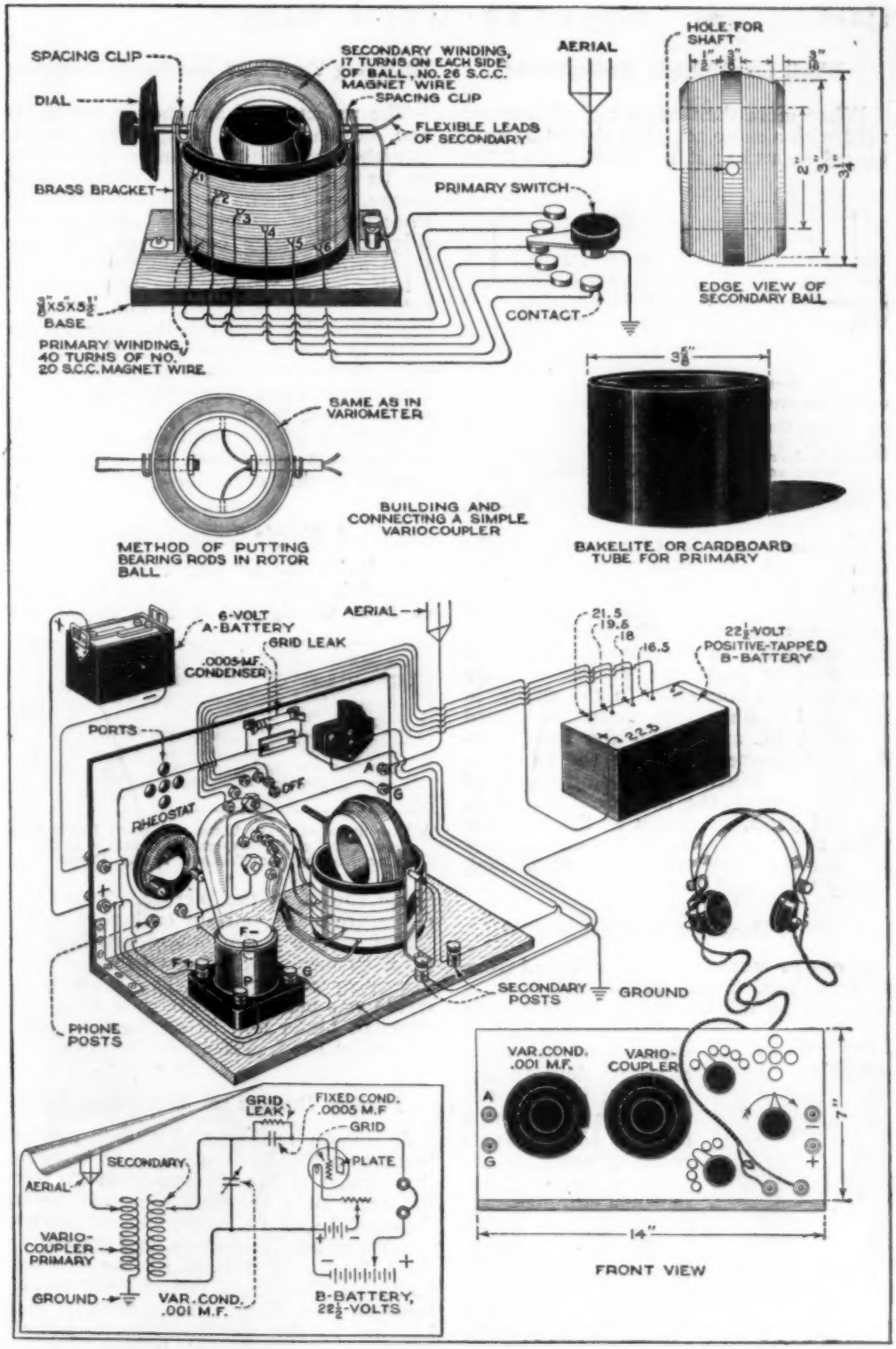
THE form of receiver described in this article is a very popular one for reception from broadcasting stations; it gives excellent results for distances up to 250 miles and can be built at small cost. Under average conditions, telegraphic signals can be received within a radius of 1,500 miles, on wave lengths from 150 to 400 meters. The instruments are mounted on a 3/16-in. bakelite panel, fastened to a wooden base by two angle irons. The variable condenser used is of .001-mf. capacity and is of the panel-mounting, 43-plate type. The variocoupler may either be bought ready-wound, or the knock-down parts are wound and assembled. The stationary bakelite or cardboard tube is wound with 40 turns of No. 20 single cotton-covered magnet wire and six taps are taken off at approximately equal steps; these taps are led off to the contact points of the primary switch, as shown at the upper left. The secondary, or rotor, of the variocoupler is wound with 34 turns of No. 26 single cotton-covered wire, 17 turns on each half, and the leads are brought out, through the hollow shaft, to a pair of binding posts. The tube socket is mounted on the base, at the left of the variocoupler; in front of the socket, the 6-ohm battery-type rheostat is placed, and above it several holes are drilled through the bakelite for observing the brilliancy of the tube filament when in operation. The binding posts for the ear phones are located in the panel directly in front of the socket. The switch for the primary of the variocoupler is mounted on the panel, at the right of the socket, looking at it from the rear, and it should be noted that the switch lever is connected to the ground post. Above the primary switch is located the B-battery switch, which has the "off" point at the right; this switch is for the purpose of varying the B-battery voltage on the plate of the detector tube. The grid condenser is placed on the panel above the variocoupler; this condenser is of standard type with a capacity of .0005 mf. The grid leak has a resistance of 2 megohms, and is of the ordinary type, obtainable from any dealer in radio supplies. Six binding posts are placed on the panel, one for the aerial, one for the ground, two for the A-battery, which is a 6-volt, 40 or 60-ampere-hour type, and the other two are for the ear phones. The B-battery is a positive-tapped 22½-volt unit of standard make. The taps are connected to the B-battery switch taps on the panel; the various voltages are plainly marked on the battery unit, and should be connected to the switch in the order shown.

Use No. 18 insulated fixture wire for the circuit and carefully solder every connection. Bare, tinned copper wire, with varnished cambric tubing or "spaghetti" slipped over it, can be used, but the fixture wire is cheaper and serves just as well. The detector tube used is a UV-200. The dials for the variable condenser and variocoupler are of standard make.

The proper aerial to use with this type of receiver is one wire, 125 to 150 ft. long, placed from 30 to 50 ft. above the ground. The phones should be wound for at least 2,000 ohms' resistance. If desired, the instruments can be placed in a cabinet, to make a neat and compact set, at the same time protecting the various parts from dust. Many operators prefer the variable condenser in series with the aerial with a receiver of this type, instead of across the secondary, as shown in the diagram, as closer tuning may be had for the radiophone broadcasting stations. It is suggested that both ways be tried out, to find which best suits the aerial used, as under varying conditions the results will differ.

LIST OF MATERIALS

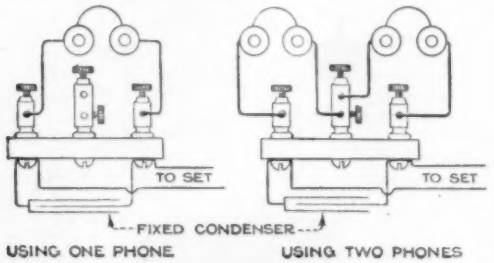
1 variable condenser, .001-mf. capacity.
1 grid condenser, .0005-mf. capacity.
1 UV-200 detector tube.
1 tube socket.
6 binding posts.
2 angle irons.
1 battery rheostat.
1 bakelite panel, 3/16 by 7 by 14 in.
1 wood base, ½ by 6 by 14 in.
1 variocoupler.
2 switch levers.
12 contact points.
1 22½-volt B-battery unit.
1 storage battery; 6 volt, 40 or 60 ampere-hour.
1 pair 2,000-ohm phones.



A Simple and Easily Made Receiver for Broadcasting-Station Work: It Has a Wave-Length Range of 150 to 400 Meters, and a Working Radius, for Telephone Work, of 250 Miles. Telegraph Stations can be Heard at a Distance of 1,500 Miles. Standard Instruments are Used Throughout

Block for Multiple Radiophones

When more than one set of phones are used with a radio set, they should be connected in series; it is also best to shunt



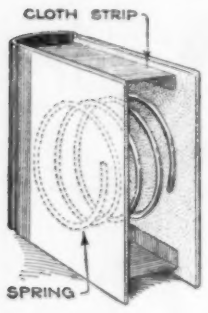
Block for Connecting One or Two Sets of Ear Phones to the Radio Set: The Efficiency of the Phones is Increased by Shunting a Small Fixed Condenser across the Phone Circuit, as Shown

a small fixed condenser across the circuit, as in the diagram.

The block illustrated for connecting the two sets of phones is fitted with three binding posts, which are mounted in a straight line. The central post is of the two-hole type and is left "blind," not being connected in the circuit. The two end binding posts are of the ordinary type and are connected in the circuit in the usual manner. The posts are spaced about ¾ in. apart, and the fixed condenser is connected across the two outside ones. When only a single pair of phones is used, the tips are fastened in the end posts, as shown at the left, but when two sets are used, the connections are made as at the right.—W. C. Michel, Jersey City, N. J.

A Bookshelf Accessory

If one or more books are removed from a bookshelf, those remaining have a tendency to fall over sidewise, not only giving the shelf a bad appearance but also allowing dust to accumulate between the volumes. These troubles can be overcome by using an expansion dummy book that will automatically fill the space occupied by the removed book. Such a dummy is made by simply placing a spiral spring between the covers of an old book. Strips of cloth are pasted between the covers at top and bottom to prevent the spring from falling out.—Harry H. Schneckloth, Omaha, Neb.

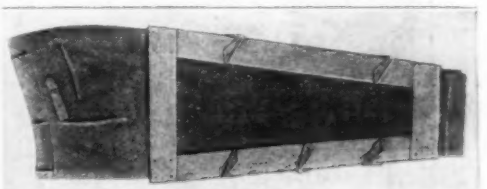


Restoring Tarnished Headlamp Reflectors

The reflectors of automobile spotlights and headlamps will frequently become tarnished, especially if the car is allowed to be exposed to the weather, dust, smoke, or fumes. A simple means of restoring the reflectors almost to their original brilliancy consists in cleansing them with alcohol and sulphuric acid. To a half pint of alcohol, a tablespoonful of sulphuric acid is added. The reflectors are thoroughly rinsed in this solution for 10 or 15 seconds, after which the surface is washed with alcohol alone, and later with clear water, then polished with a piece of soft linen. It is important that every trace of the sulphuric acid be removed from every part of the lamps, to prevent further corrosion.

A Simple Trousers Press

A device for keeping trousers freshly pressed is easily made from a few strips of light wood, tacked together in the



A Few Strips of Light Wood and Some Heavy-Wire Paper Clips, or Clothespins, Made into a Device for Keeping the Trousers Neatly Pressed

shape shown in the picture. Two such forms are made, one for each side of the folded garment, and these are held in place by means of large wire paper clips or spring clothespins. The press illustrated was made from the slats of an old venetian blind, but, of course, any light hardwood strips will serve.

Feather Dusters for Chick Brooder

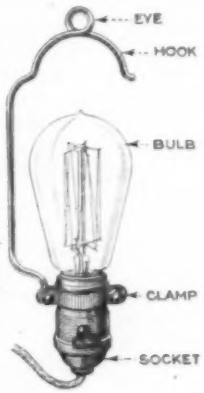
A woman raising and selling poultry bought an incubator in order to increase the number of her chicks, but overlooked the need for a brooder. However, when the eggs began to hatch, she obtained a number of feather dusters, and suspended them from the rafters in the chicken house, so that the feathery ends barely touched the floor. The chicks, just hatched in the incubator, were turned loose among the dusters, finding in them an excellent substitute for a mother hen. —Littell McClung, Florence, Ala.

Identifying Golf Clubs

A good way to mark golf clubs is to coat the end of the handle with a thin layer of sealing wax, into which the owner's initial is impressed with a seal. This method is quite effective, and a short stick of the wax can be carried in the golf-ball pocket of the golf bag, in case the wax should require renewing.—Marion B. Cook, Bellport, N. Y.

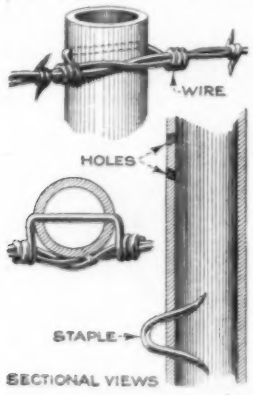
A Handy Electric-Lamp Holder

A simple hook made from wire, and a hose clamp, can be attached to an ordinary electric-lamp socket so that the lamp can be hooked to any convenient projection. The drawing shows clearly how the device is made and attached. Such an arrangement will find many useful applications in the garage, shop, home, or office. If desired, the hook can be turned at right angles to the light.—George O. Reed, Detroit, Mich.



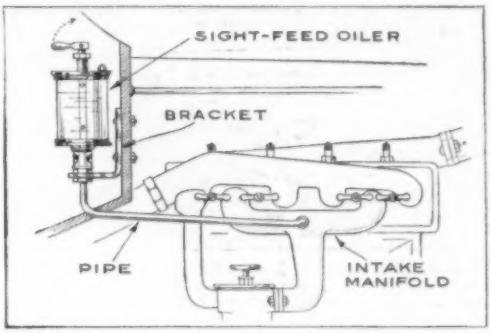
Fastening Barbed Wire to Iron Posts

Occasionally it is desired to attach plain or barbed-wire fencing to posts made of old iron pipe. The simplest way is to drill small holes through the post wherever the separate strands are to come and use wire ties. After the posts are set up, the ties, each about 1 ft. long, are run through the holes and wrapped around the wire on opposite sides of the post. Regular fence staples can be used if the holes are drilled at an angle, so that, when the staple is driven in, the ends will spread apart inside the pipe, and prevent the staple from being pulled out, accidentally, while permitting it to be removed easily, when desired.



Priming the Auto Engine

An ordinary sight-feed oil cup, such as used on most types of stationary engines, affords a convenient means of holding a quantity of special high-gravity fluid for priming an automobile engine. The oil cup can be mounted on the dash of the car, on a sheet-metal bracket, as indicated, the priming fluid being conducted to the intake manifold of the engine through suitable tubing.

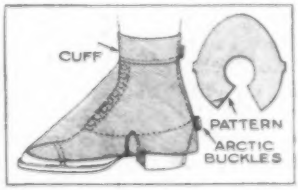


A Sight-Feed Oiler, Attached to the Dash of the Auto, Affords a Convenient Method of Priming the Engine in Cold Weather

By this method the engine can be primed from the driver's seat without the necessity of raising the hood to inject gasoline into the cylinders through the priming cups. The flow of fluid to the engine is controlled by raising or lowering the snap lever on top of the lubricator. The amount fed is adjusted by means of the nut on the needle valve.

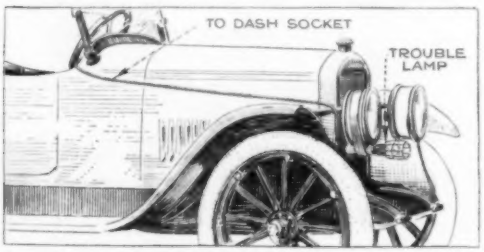
Shoe Guard Prevents Soiling and Damage

Many good shoes have been ruined by acid, oil, paint, whitewash, and other materials, which, had the shoes been suitably protected, would not have injured them. The shoe cover illustrated is made from a piece of rubber, canvas, or other material, cut to shape and fitted with a cuff of the same material, to which the buckles from a pair of old arctics are fastened. A strap fastened to the projecting ears of the guard passes under the instep like a legging strap. The old buckles are at the back and allow the covers to be slipped on or removed quickly.



Trouble Lamp Used as Headlight

A simple expedient, when one or both headlights go out, is to attach the trouble lamp to the underside of one of the



An Extension Trouble Lamp Fastened to the Underside of One of the Headlights Makes Night Driving Safe, and Prevents Arrest for Driving without Lights

headlamps, preferably the right-hand one. Cord, wire, or rubber bands can be used for holding the extension lamp in such a position that the light will shine ahead. Tlhis idea makes it possible for the driver to avoid arrest in places where the laws against driving without lights are strictly enforced.

Enlarged Photographic Negatives

The making of numerous enlargements is a tedious and expensive undertaking, when a number of large prints are required from a small negative. The alternative is to make a copy negative from an enlargement, but by this method a considerable amount of the original negative's quality is lost. By the following process, however, large prints that are as good as the negative, can be obtained from small negatives with the rapidity and cheapness of contact printing.

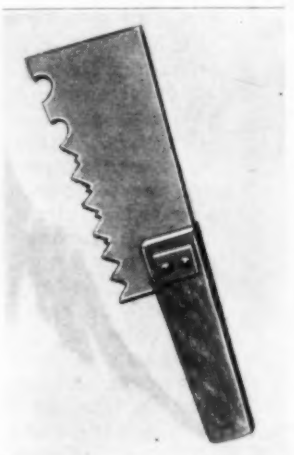
First, an enlargement is made in the ordinary way, but instead of making it on paper a "slow" plate or a piece of commercial film is used; the film being preferable because it is more easily handled. One grade faster than the process plate or film is about right. The process grade is too "contrasty," but may be used when the original negative is lacking in this quality. The enlargement will, of course, be a positive, and should be made slightly flat and dense; in other words, slightly overexposed and carried to a rather full development. The positive is fixed and washed in the usual way. Next, a tray, somewhat larger than the positive, is filled with water. In the bottom a piece of glass, also larger than the positive, is placed. Then, working in the red light, a piece of unexposed film of the same grade as the positive is immersed in the water so that no air bells form on it, and allowed to remain until it is quite limp. Care must be taken not to touch the face of the film, which should be uppermost, with the fingers at any time.

When the film has become quite limp, it is permitted to settle onto the glass at the bottom. The well-washed positive, still wet, is immersed with a sliding motion to prevent the formation of air bells, but face, or film side, down, and settled on top of the unexposed piece of film or plate, whichever is used, thus bringing the two film sides together. Another piece of glass is slid into the water and brought down on top of the positive, with the two films between. The water is then allowed to remain undisturbed for a moment, until it becomes quiet and no movement is visible. The exposure is made by burning a match about 2 ft. above the tray. If the positive is very dense, two or three matches may be required to get full exposure. The glass is then removed, the films separated and the exposed piece developed, fixed, and washed as usual.

The resulting negative, when properly made, is fully equal in quality to the original, and is not the makeshift usually obtained by copying. While it is possible to let the positive dry and then make a negative by contact in the printing frame, the underwater process produces much better results with the additional advantage of a saving in time.

Brush Hook Made from an Old Saw

A wood cutter uses the hook shown in the picture for cutting brush and small branches, the end of an old crosscut saw being used for the blade. Finding that his ax was not the proper implement for cutting the brush, he cut a foot from the end of an old crosscut saw and bolted it to a hardwood handle. The back of the blade is sharpened to a cutting edge. This makes a splendid tool for the purpose.



PRIZE OFFERS AND ANNOUNCEMENTS

PAN-PACIFIC COMMERCIAL CONFERENCE TO BE HELD AT HONOLULU, HAWAII

At Honolulu, the capital of Hawaii, centrally situated in the Pacific Ocean, a great gathering of the most influential commercial and financial men from all lands bordering on the Pacific will meet each other daily during the two weeks from October 25 to November 8. At these meetings, held under the auspices of the Pan-Pacific Union, plans will be formulated for future interracial coöperation in matters of common interest. It is expected that more than a hundred delegates, representing government departments, chambers of commerce, or commercial organizations, will attend, including some from the U. S. departments of Commerce, Agriculture, the Navy, and the Interior. Delegates from similar government departments will attend from Canada, Australia, New Zealand, Japan, China, and other Pacific countries. It is expected that President Harding will sound the keynote of the conference in his message, which is to be read by the governor of Hawaii at the opening session.

PULITZER AND OTHER AIR-RACE COURSES MADE OVER WATER INSTEAD OF LAND

At the third annual aerial contests for the Pulitzer and other trophies, held at Detroit, October 7, 12, 13, and 14, several changes were made in the race courses. For the sake of safety the Pulitzer was changed to a water course. Starting at Selfridge Field, Mt. Clemens, Mich., the course has been made triangular, and 40 miles long, as in previous contests, but easterly over Lake St. Clair instead of westerly over land. Other courses that have been similarly changed are those for the Detroit News aerial-mail trophy, for the Aviation Country Club of Detroit trophy race, and for the Liberty Engine Builders' trophy race. Altogether there are five events at these contests, and $10,000 in cash prizes, besides which $30,000 worth of gold and silver trophies are awarded.

SOCIETY FORMED TO PROVIDE LEISURE FOR BUDDING AUTHORS AND ARTISTS

A new idea of great interest to artists and authors is the formation by a group of American and French artists of a society called "Bel Esprit." The originator of the idea, Ezra Pound, a Chicago poet, expresses it thus: "To give an artist leisure to work is actually to take part in his creation." It was with this object that the society was founded, and already one American poet, T. S. Eliot, has been rescued from his uncongenial work in a bank, and given leisure for the exercise of his genius. The society first finds the man, and then supports him in leisure, as long as is necessary to develop his talent, by the coöperation of subscribers, who are now being sought in both America and France. The society's address is: Bel Esprit Sanctuaire, 20 Rue Jacob, Paris, France.

ONE WEEK IN OCTOBER SET ASIDE FOR GOOD-HEALTH PROMOTION

An organized movement for better health that, according to Secretary of Labor James J. Davis, should have the support of every man, woman, and child in America, is being promoted by a large merchandizing group known as the "Good Health Week Promotion Bureau." A campaign being conducted by them will culminate in the week of October 23-30, which has been set aside as a period of national emphasis on health, especially as connected with ventilation, sanitation, and personal hygiene. By letters, exhibits, and lectures, comprehensive information will be given out on these health subjects in an authoritative but snappy manner, calculated to make the people ask questions. Self-interest in health is the end aimed at. The work is being conducted by the Executive Committee, Good Health Week Promotion Bureau, 209 Grand Ave., Milwaukee, Wis.

PRIZES ARE OFFERED FOR BEST DESIGNS OF THREE CLASSES OF CLOCK CASES

Designers and draftsmen are invited to compete for $1,200 in prizes offered for the best clock-case designs. Three classes of mantel clocks are required, diagrams and particulars of which will be furnished, and for the three best designs in each class prizes of $250, $100, and $50 will be awarded. The contest is open to everyone, and any number of designs may be submitted. The designs must be delivered not later than Oct. 23, 1922, to Clock Design Competition, Cloister Clock Corporation, Room 1340, 200 Fifth Ave., New York City.

ENGLISH PUBLISHERS OFFER A REWARD FOR A BOOK OF SELF-REVELATION

For a book of self-revelation an English publishing concern offers £250 advance royalties, and any added royalties that may accrue from the sale of the book after publication. It may be in the form of a diary, a journal, or a novel, and it may be long or short. The writer is to remain anonymous. Truth to life is the feature most desired. Typewritten manuscripts must be submitted not later than Dec. 15, 1922. Address, Messrs. A. M. Philpot, Ltd., 69 Great Russell St., London, W. C. 1, England.

U. S. CIVIL SERVICE EXAMINATIONS TO FILL VARIOUS VACANCIES

Competitive examinations for senior engineer, grade 2, and for senior architect, will be held in various cities and towns throughout the United States, and applications will be rated as received until further notice. The initial salaries are $2,100 to $2,700 a year, and appointees at salaries of $2,500 or less may receive a bonus of $20 a month.

Examinations will be held Dec. 6-7, 1922, for computer, Coast and Geodetic Survey, at a salary of $1,400 a year for service at Washington, and $2,000 a year for duty at Manila, P. I., in both cases with the added bonus of $20 a month.

For junior engineer, junior physicist, and junior technologist, examinations will be held Nov. 22, 1922, for vacancies in the Bureau of Standards at salaries of $1,200 to $1,500 a year with the added bonus of $20 a month.

Applicants for any of the above positions should write at once for Form 1312, stating the title of the examination desired. Address, Civil Service Commission, Washington, D. C., or the Secretary of the U. S. Civil Service Board in the applicant's vicinity.

MONTHLY PRIZES OFFERED FOR PHOTOS BY AMATEURS OR PROFESSIONALS

For the encouragement of pictorial photography prizes are offered monthly by the publishers of American Photography. Not more than three prints may be submitted monthly by any photographer, amateur or professional. Prints must be accompanied by data filled out on a form furnished by the publishers. There are two classes: senior, with prizes of $10, $5, and $3 in value; junior, with prizes of $5 and $2. Address, American Photography, 428 Newbury St., Boston 17, Mass.

PRIZES FOR THE BEST PROFESSIONAL NAME FOR A YOUNG SCREEN ARTIST

With the object of securing an attractive professional name for the young screen artist, Helen Lynch, $375 in prizes is offered in a "My Name Campaign," now being conducted by The People's Home Journal. Anybody may compete by writing the name on a postal card, signing it, and mailing it on or before Dec. 1, 1922. Any number of names may be sent in by the same person. Address, Motion Picture Editor, The People's Home Journal, 80 Lafayette St., New York City.

GOLD MEDALS OFFERED FOR EXCELLENCE IN LITERATURE AND KINDRED ARTS

The National Literary Society, recently founded for the purpose of promoting American literature, elocution, and drama, will award annually a gold medal, properly engraved, to the highest competitor in each of the following nine contests: declaimer, reciter, orator, debater, poet, essayist, novelist, short-story writer, and playwright. The home office of the society is at Washington, D. C., but branches are being organized to cover the entire country, and these contests will be held first in each county seat, the fourth Wednesday of January; then county winners will compete in the largest city in each congressional district, the second Wednesday of February; winners in these contests will compete in the capital city of each state, the fourth Wednesday of February; and a final contest will be held in Washington, D. C., the second Wednesday of March, annually. The contests are open to any member of the society, and any white resident of the United States is eligible to become a member by the payment of an annual fee of $1. Address, The National Literary Society, International Building, Washington, D. C.

CONTESTS PREVIOUSLY ANNOUNCED

Medals, Diplomas, and Money Awards: Announced August issue, 1921; awards offered by the Franklin Institute.

For Service to City of Philadelphia: Prize $10,000; announced September issue, 1921; awarded each year by Edward Bok, former editor of The Ladies' Home Journal.

One Million Francs for Best Motor: Announced January issue, 1922; closes June 1, 1923; address, Aero Club of France, Paris.

Research Thesis by a Woman: Prize $1,000; announced October issue, 1921; awarded annually; address, Dr. Lilian Welsh, Goucher College, Baltimore, Maryland.

Annual Commercial Airplane Contest for "Italy's Great Trophy": announced July issue, 1922; address, Aero Club of Italy.

Ideas for New Occupations for Shut-Ins: Prizes, $100, $50, and $25; announced July issue, 1922; closes Nov. 1, 1922; address, Prize Editor, Popular Mechanics Magazine, 6 North Michigan Ave., Chicago.

Fishing Contest: Prizes, seven "Model 94" Winchester hunting rifles; announced July issue, 1922; no definite closing date.

Best Novel by an American Author: Prize $2,000; announced August issue, 1922; closes March 1, 1923; address, Harper & Brothers, New York City.

Designs for Chicago Tribune Building: Prizes, $100,000; announced August issue, 1922.

Best Essay on a Historical Novel: Prize $100; announced September issue, 1922; closes Dec. 1, 1922; address, Kenyon College, Gambier, Ohio.

Competition for American Composers: Prizes from $1,000 to $100; announced October issue, 1922; closes Dec. 15, 1922; address, Mrs. Edwin B. Garigues, Room 201, Bellevue-Stratford, Philadelphia, Pa.

Best Symphonic Composition: Prize $1,000; announced October issue, 1922; closes Jan. 1, 1923; address, Balaban & Katz, 175 N. State St., Chicago, Illinois.

For Musical Compositions: 24 prizes; announced October issue, 1922; closes Dec. 1, 1922; address, The Etude Prize Contest, 1712 Chestnut St., Philadelphia, Pa.

¶A new variety of winter apple, originated by the Minnesota State Fruit-Breeding Farm, is not grown from seed as stated on page 203 of our August issue, but by budding and grafting. This apple is attracting considerable attention from orchardists.

AMERICA'S LARGEST CITIZEN TAKES AIRPLANE SPIN

IT is seldom that a private citizen would dare to make light of an intrepid airman, yet that is what giant Johan Aason was doing to Pilot Horchem shortly after their descent from a 1,500-foot height to which they climbed. In the course of the flight the pilot played a few tricks on the giant, and the giant showed some of his own tricks to the pilot. The flight was made under a wager that with the giant in the cockpit, the "Swallow" would never get off the ground. However, at the end of five minutes they had climbed to an altitude of 1,500 feet, a most remarkable feat for a ship the size of the "Swallow," considering the load.

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